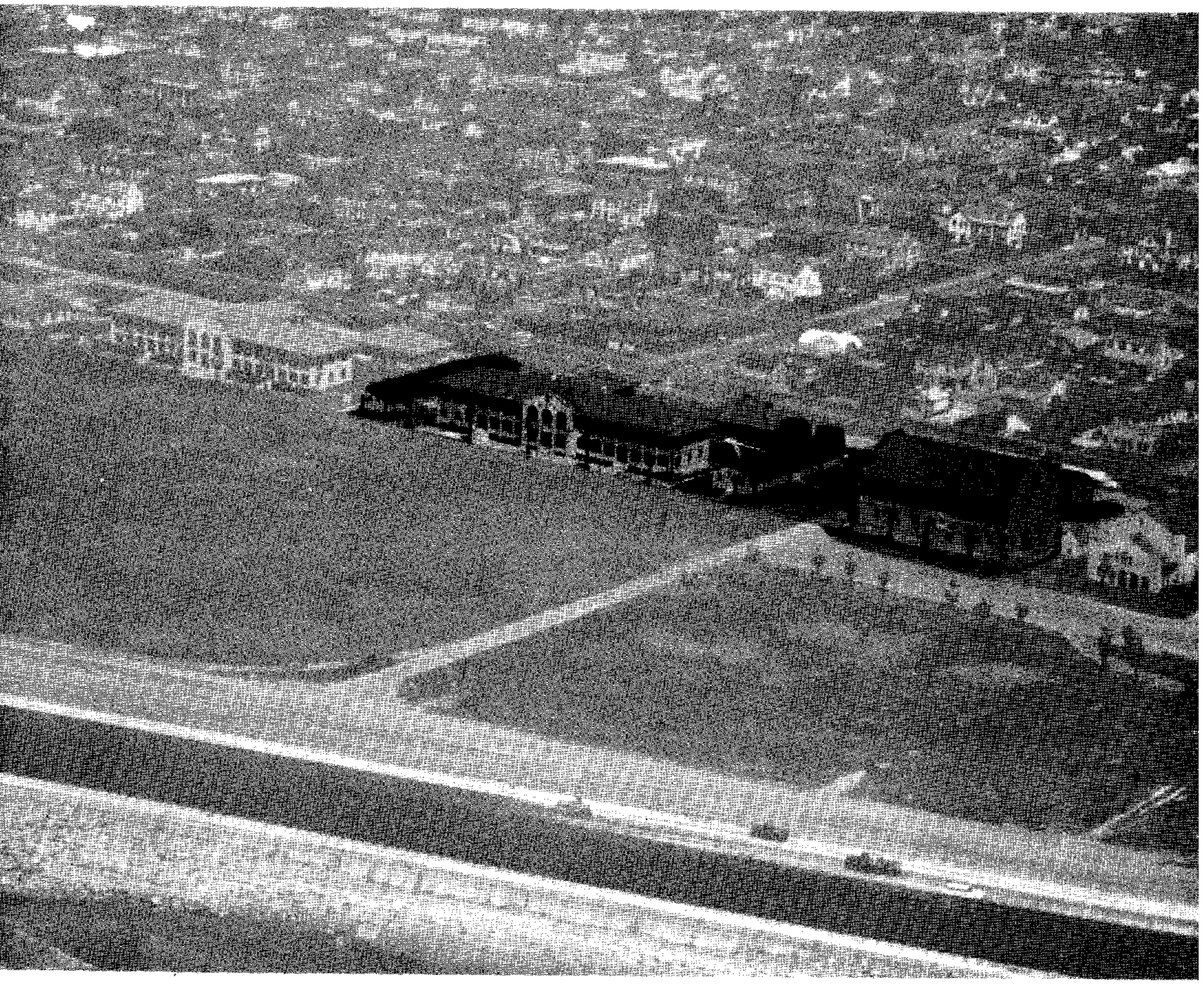
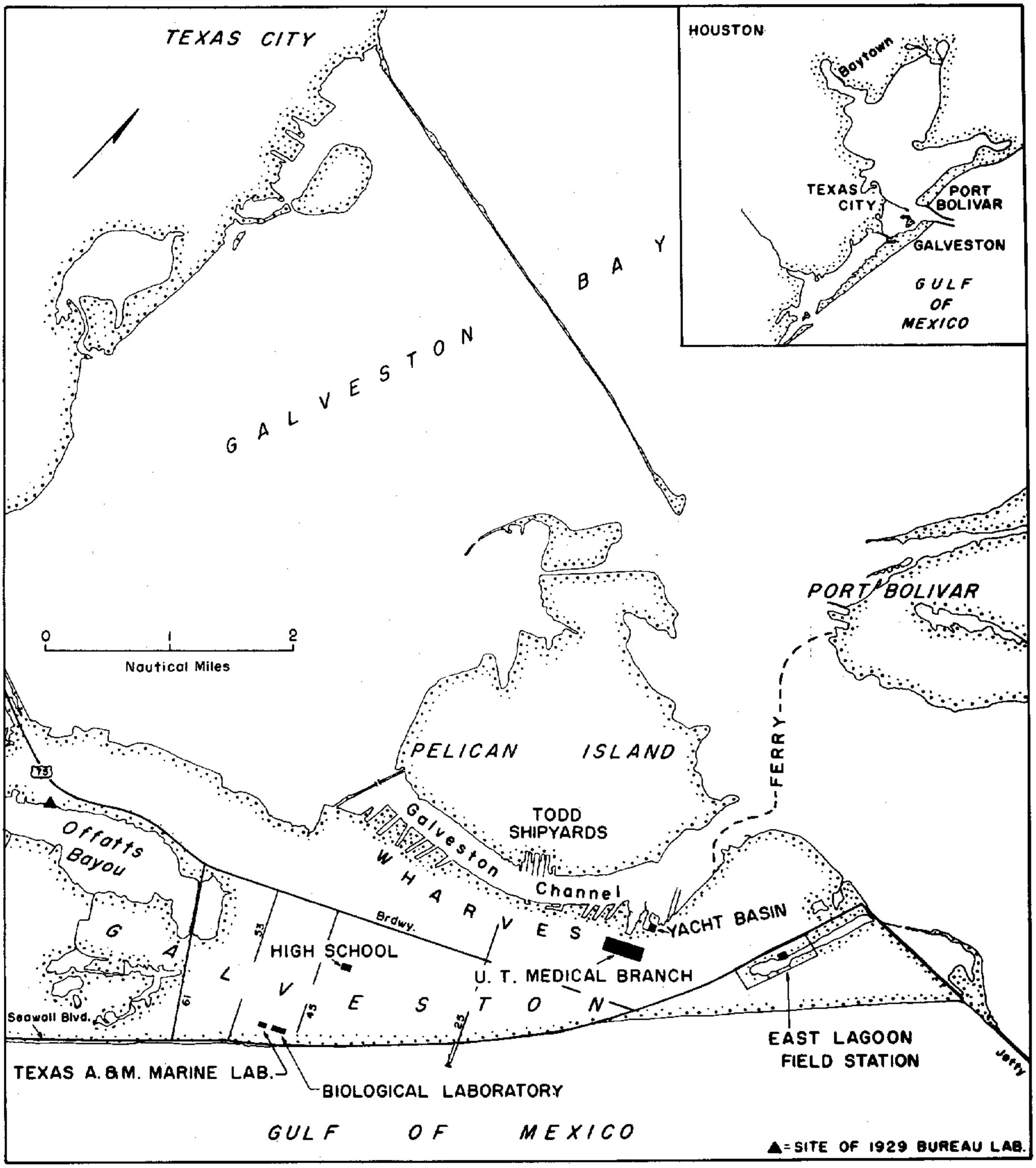
BUREAU OF COMMERCIAL FISHERIES
BIOLOGICAL LABORATORY, GALVESTON, TEXAS

Circular 154



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES



City of Galveston. The inset shows the general location at the mouth of Galveston Bay.
(Photographed by Lew Stewart.)

Front Cover-- The biological laboratory close behind the famous Galveston seawall on the Gulf of Mexico.
(Photographed by Lew Stewart.)

BUREAU OF COMMERCIAL FISHERIES BIOLOGICAL LABORATORY
GALVESTON, TEXAS

By George A. Rounsefell, Laboratory Director
Bureau of Commercial Fisheries

ESTABLISHMENT OF LABORATORY

The Bureau operated a small laboratory on Offatts Bayou in Galveston, Tex., in 1929 to study factors affecting the spawning and setting of oysters (Hopkins, 1931), which are harvested in several areas of Galveston Bay. This laboratory was discontinued in 1930; in 1931 the Bureau initiated an investigation of the South Atlantic and Gulf of Mexico shrimp fishery. At that time the fishery was only for the white shrimp, *Penaeus setiferus,* which was most abundant in Louisiana. Field work was carried on at several points from a headquarters office in New Orleans.

When a Gulf of Mexico fishery laboratory was established in 1950, Galveston (population 71,000) was the site chosen because it is one of the very few locations with a deepwater harbor opening directly to the Gulf that at the same time offers the variety of facilities desirable for successful operation--adequate housing, good schools, availability of all types of industrial services and equipment, library facilities, and an established commercial fishery. Galveston became an organized town in 1836 and a port of entry in 1837, the first in Texas. Although a major port, it is also a cultural center; each year a series of concerts includes performances by symphony orchestras from major U. S. cities, e.g., Detroit, Cincinnati, and Indianapolis.

CLIMATE AND RECREATION

The climate is mild; summer temperatures, seldom exceeding 90 degrees, are tempered by steady onshore breezes. Winter temperatures may drop during northerly storms into the 40's. During occasional years there may be light frost; the minimum temperature was 18° F. over a 60-year period. All of the offices and laboratories are air-conditioned to provide efficient working conditions.

Because of the agreeable climate, the area provides summer recreation for inland residents. The 25-mile beach is thronged with bathers, picknickers, and fishermen. Water skiing is a favorite sport. Fishing for channel bass, sea trout, Spanish mackerel, and flounders is excellent. Some fish from party boats, hundreds fish from a number of free fishing piers, many surf cast, and great numbers take advantage of numerous ramps to launch their outboard craft.

RESEARCH PROBLEMS

The research problems in the Gulf of Mexico are many and complex. Fishery research in the area is so recent that even the number and distribution of species are imperfectly known. Although it has been found that many species--menhaden, mullet, the three chief species of commercial shrimp, and most of the sciaenids--among others--spawn offshore, and the postlarvae or very young juveniles enter the protected bays and estuaries which they utilize as nursery areas; the role of the estuaries is not fully understood. They not only furnish nursery areas for these quasi-catadromous species but also contain large populations of blue crabs, oysters, and resident fishes. It is difficult to overestimate the importance of these estuaries to the fisheries

Determining density of juvenile shrimp in a typical estuarine nursery area by means of a push net.

of the Gulf. Galveston is an especially desirable location for studying estuarine forms because it is in a transitional zone between the wet humid coast of Louisiana and the dry semiarid coast of southern Texas.

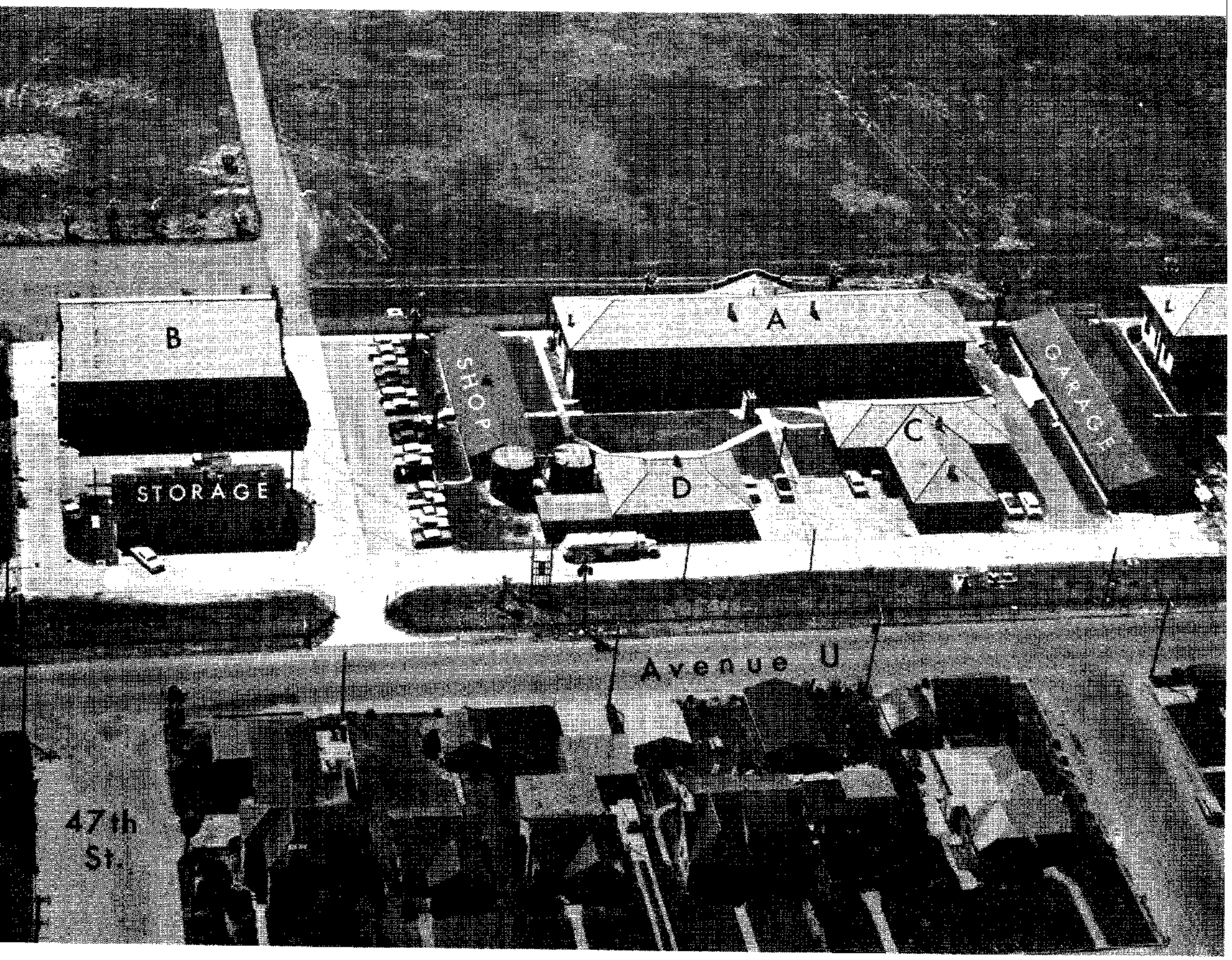
A Continental Shelf, over 100 miles wide in many places, harbors, in addition to the adults of the estuarine-reared species, a varied bottom fauna of calico scallops, wholly marine shrimps, and many shelf fishes including the snappers. The shelf is also the habitat of large schools of pelagic species, including thread herring, anchovies, and sardines. Extending from the shelf over deeper waters are tunas, marlins, and swordfish.

The Bureau of Commercial Fisheries Biological Laboratory assembles information useful for orderly and wise exploitation of these rich fishery resources, a few of which are approaching full utilization but many of which so far have been scarcely touched. This poses an enigma since it is necessary to emphasize research on the more heavily fished species without wholly neglecting to obtain information on the occurrence, abundance, and life histories of other species in order to insure the future welfare of the fisheries. Because of annual natural fluctuations in the abundance of any one species, coupled with seasonal patterns of availability, it is clearly in the best interests of the fishing industry to exploit many species instead of a few. This broader base tends to provide for year-round utilization of vessels and guards against the disaster of a temporary decline in the abundance of any one species.

LABORATORY SITE

The laboratory is in a modern residential district on the shore of the Gulf. The buildings, several of heavily reinforced concrete, were once part of Fort Crockett, a coast artillery base built about 1908. The Marine Laboratory of the Department of Oceanography and Meteorology of the A. and M. College of Texas, one block away, operates an oceanographic vessel in the Gulf. The A. and M. College of Texas also has established a Maritime Academy adjacent to their marine laboratory.

The offices and laboratories are housed in four heavy masonry buildings. Three wooden buildings are the shop, garage, and



Airplane view of the biological laboratory showing arrangement of buildings. *(Photographed by Lew Stewart.)*

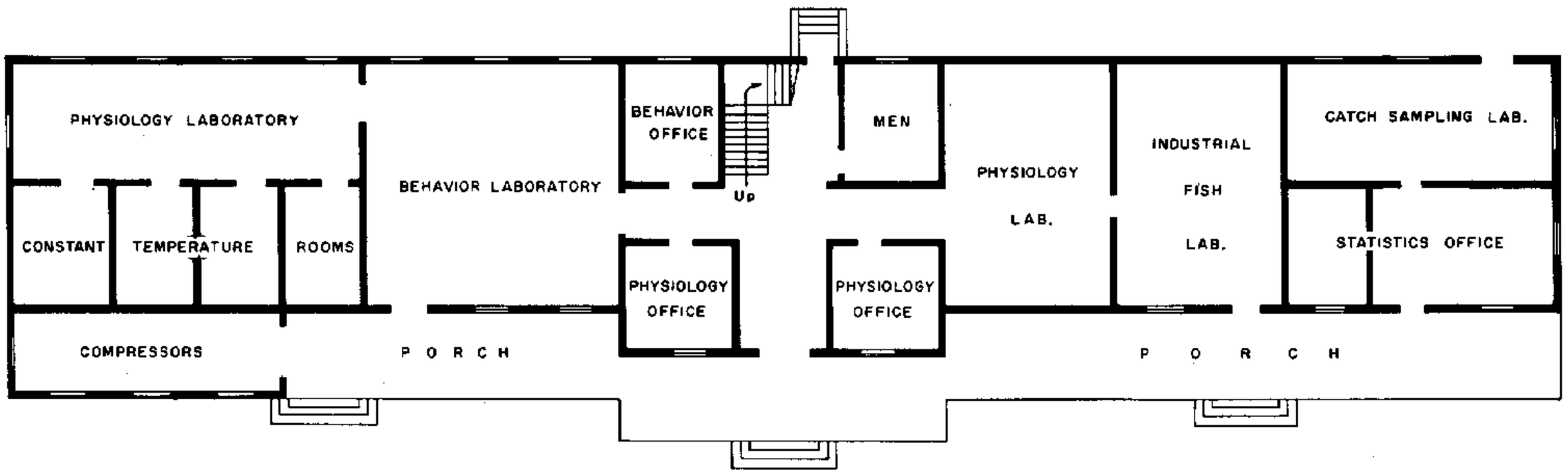
storage. A new concrete sea-water laboratory on a 140-acre tract on Galveston's East Lagoon is part of the experimental facilities.

FACILITIES

In Building A the second floor houses all administrative services, the library, the drafting and darkroom facilities, the Laboratory Director's office, and a conference room.

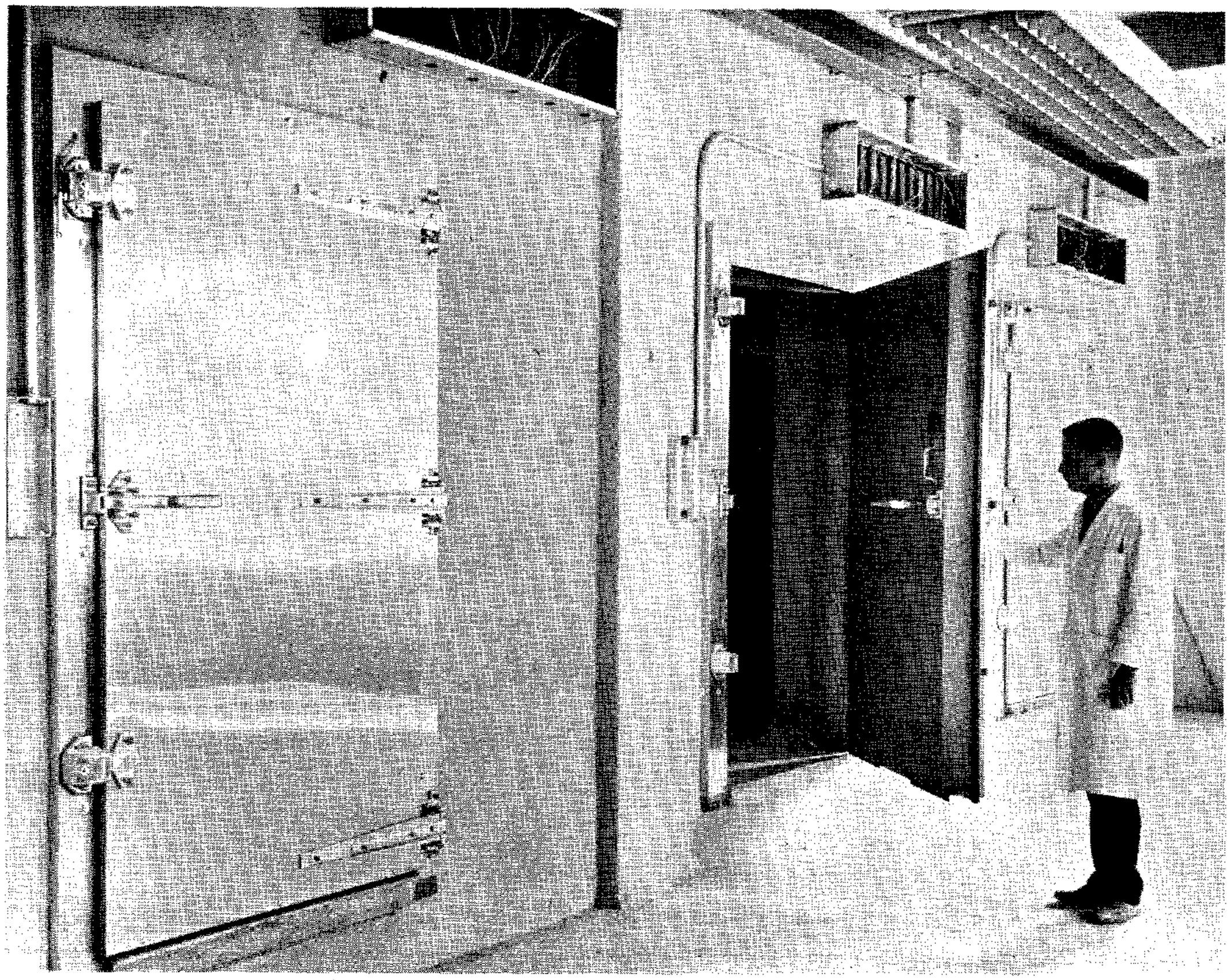
The *library*, with a trained librarian, contains over 10,000 items, including most of the world fishery journals. The library is especially strong in miscellaneous State and institutional material of limited distribution seldom found in most libraries. For general biological publications not directly related to fisheries, the excellent library of the Medical Branch of the University of Texas is within 4 miles. The Marine Laboratory of the A. and M. College of Texas (within one block) has oceanographic reports. Large scientific libraries are within an hour's drive at the University of Houston and Rice University. The laboratory library has a film and microcard reader.

The darkroom is equipped with copying cameras and photomicrographic apparatus.



Plan of building A. This heavy masonry building is 177 feet long and 28 feet wide.

Reading microcards in a corner of the library.



Four large constant temperature rooms for laboratory study of the effects of environmental factors on fish and invertebrates.

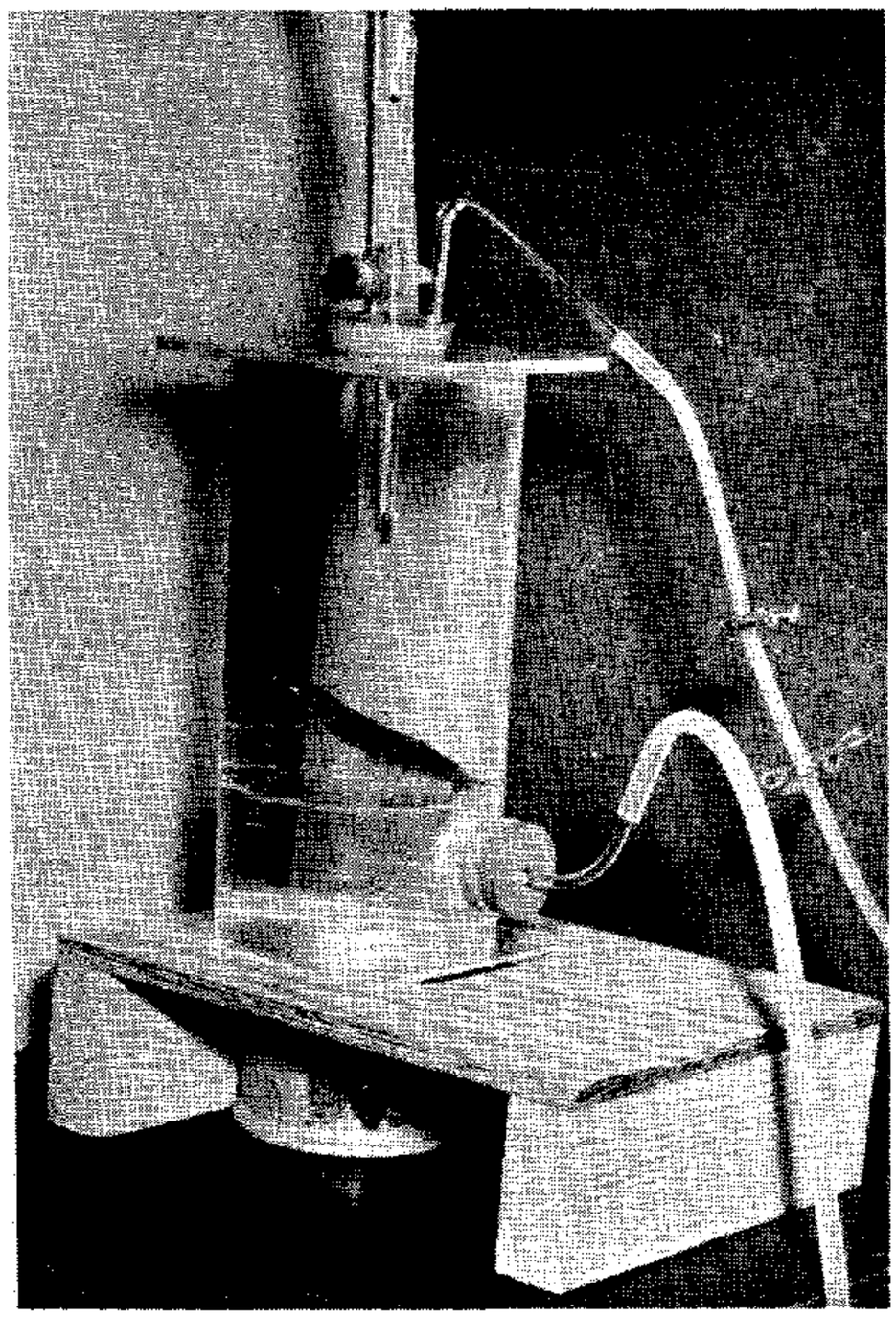
The conference room is equipped with a 16-mm. movie projector, opaque and transparent slide projectors, a tape recorder, and sets of nautical charts.

The *physiology and behavior laboratories* on the lower floor of Building A have four large (each about 8- by 10-foot) constant temperature rooms so that specimens can be maintained within a range from 30° to 95° F. These are invaluable for determining the effects and interactions of environmental factors on growth, survival, and behavior. This knowledge is especially important to an understanding of estuarine species, since Gulf estuaries exhibit wide variations, seasonal and annual, in both salinity and temperature.

For microorganisms and larval forms, which can be studied in less space, the physiology laboratory is equipped with a number of constant temperature boxes. Other equipment includes a Warburg apparatus and respirometers for larger organisms.

The *industrial fish laboratory* contains a scale projector for use in studying age and growth. A reference collection of Gulf fishes is kept for rapid identification of the great number of species that occur in the biological samples.

The *statistics office* in the east end of Building A is used by the Statistics Branch of the Bureau as Texas headquarters for the collection of detailed statistics on the fisheries. These statistics of catches by species, area, depth, and vessel are of vital importance to the work of the biologists on fish and shrimp populations.

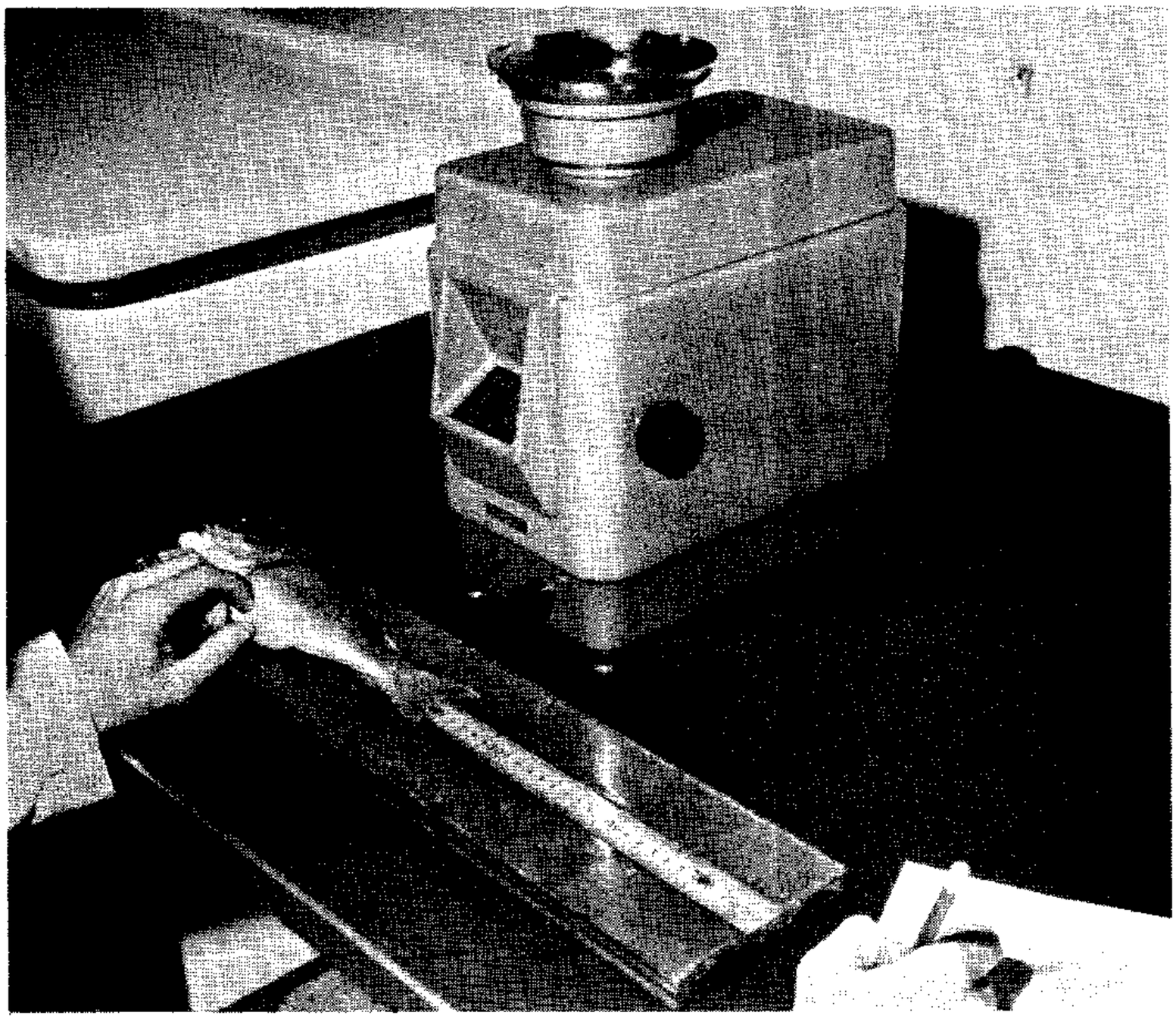


Determining oxygen consumption of shrimp in a respirometer.

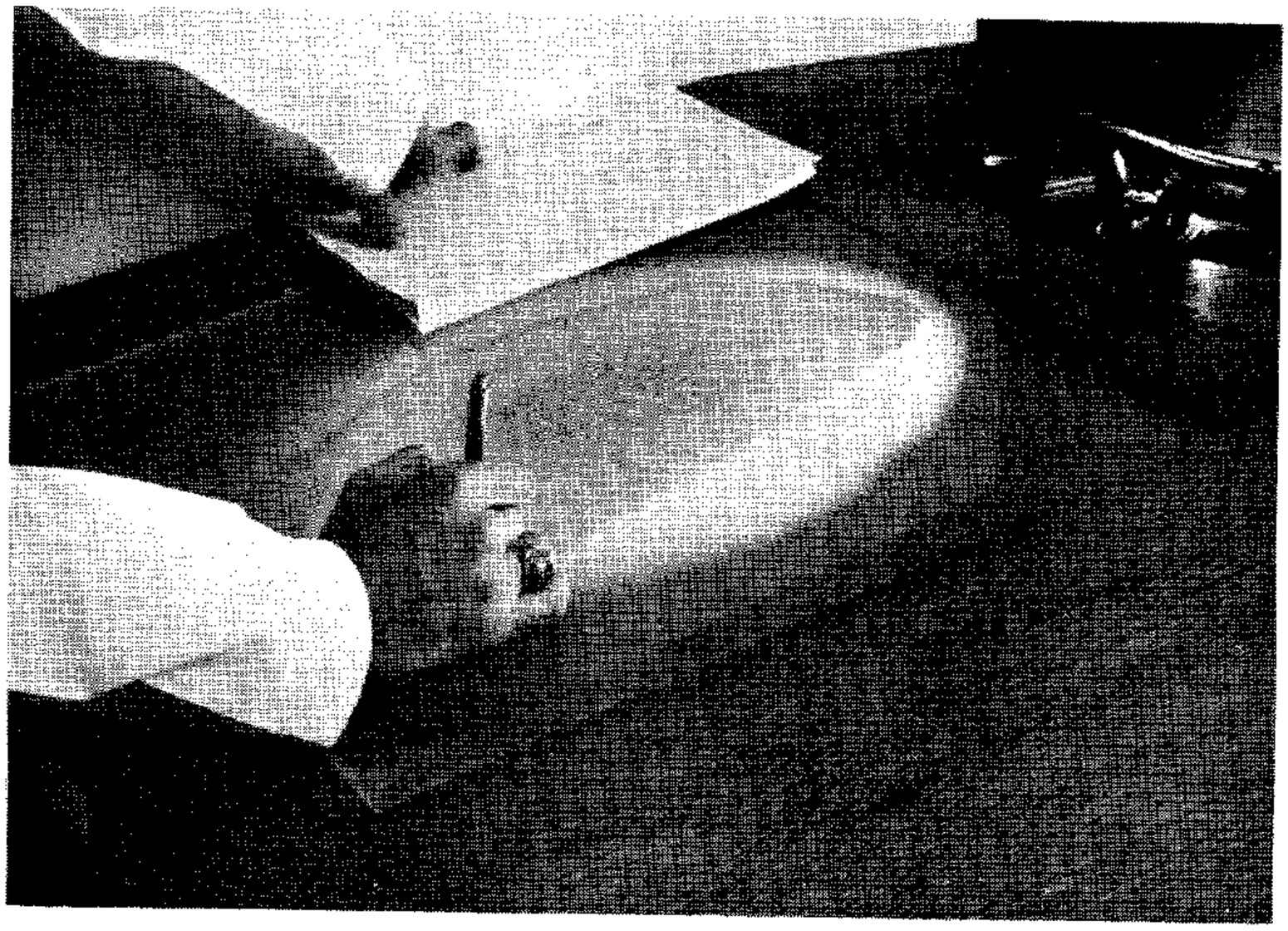
In the *catch-sampling laboratory*, data on the sizes and species composition of shrimp catches, taken by field biologists, are compiled to supplement the detailed statistics on the shrimp fishery.

The *chemistry laboratory* (Building C) provides certain specialized services to all of the other programs as well as performing assigned tasks. For instance, the laboratory has designed and built a distillation apparatus consisting of two pyrex stills with a mixed-resin deionizing column between them. The three units operating in series can produce over 100 gallons a day of pure water which is circulated to all laboratories through polyethylene pipe. The laboratory is responsible for the recirculating sea-water system (Building D) and the continuous flow sea-water system of the East Lagoon field station. The laboratory makes any necessary sea-water analyses and aids other programs in maintenance of environmental recording equipment.

The chemistry laboratory has a complete paper electrophoresis and also a moving-boundary electrophoresis apparatus for comparison and analysis of high-molecular-weight materials such as fish sera.



Weighing and measuring fish.



Projecting fish scales to facilitate age determination from the annuli.

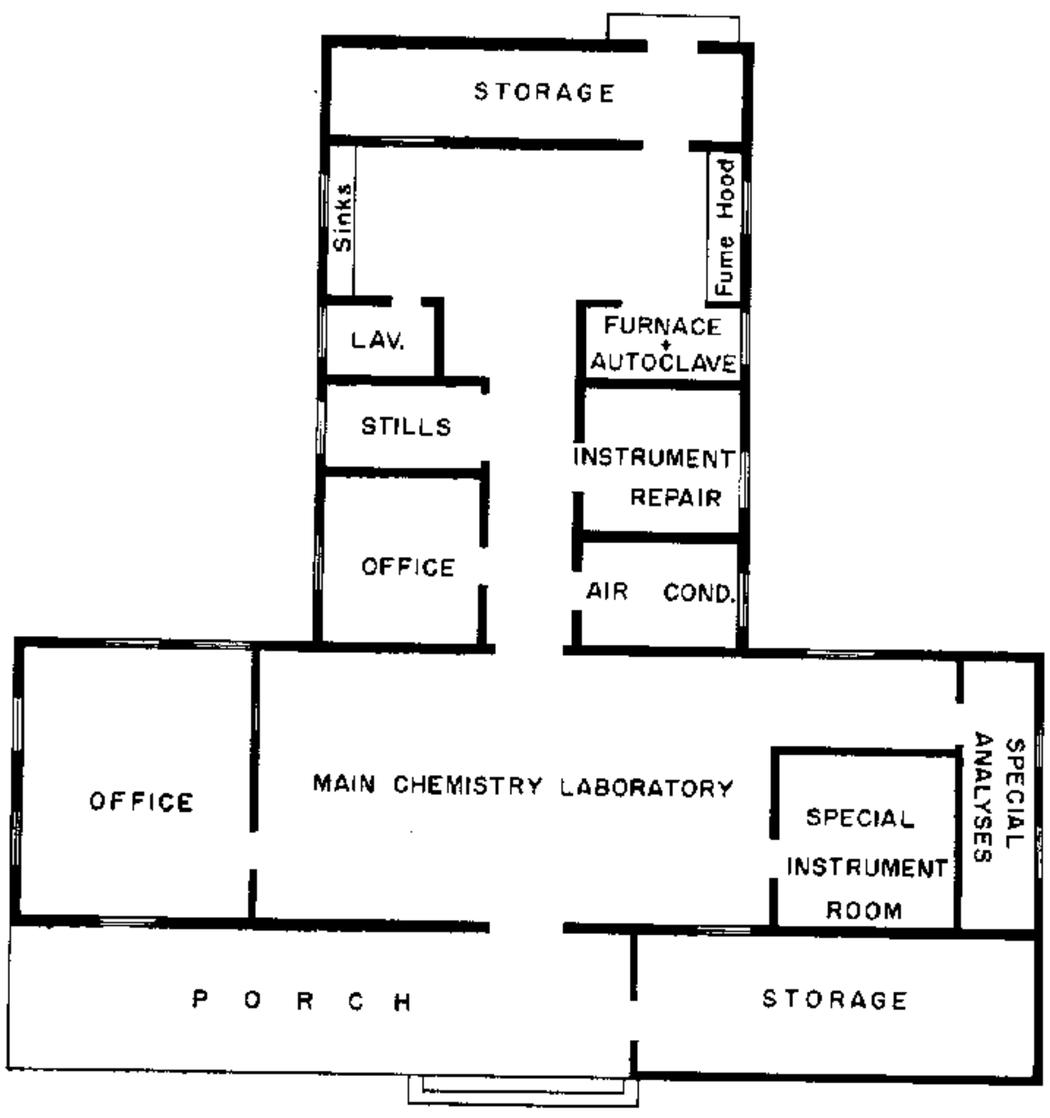
A variety of photometers includes filter electrophotometers that are used for 90 percent of routine analyses, a quartz spectrophotometer for those analyses that require a more precise wave-length control, and a recording spectrophotometer for analyses of a more specialized nature. A spectroscope and polarograph are used generally for the analysis of substances less complicated than sea water.

Caloric determinations are made with an oxygen bomb calorimeter, and some gas analyses are made with a conventional blood gas analyser.

An 8-cubic-foot autoclave with a steam pressure limit of 100 pounds is available for protein and total phosphorus analyses.

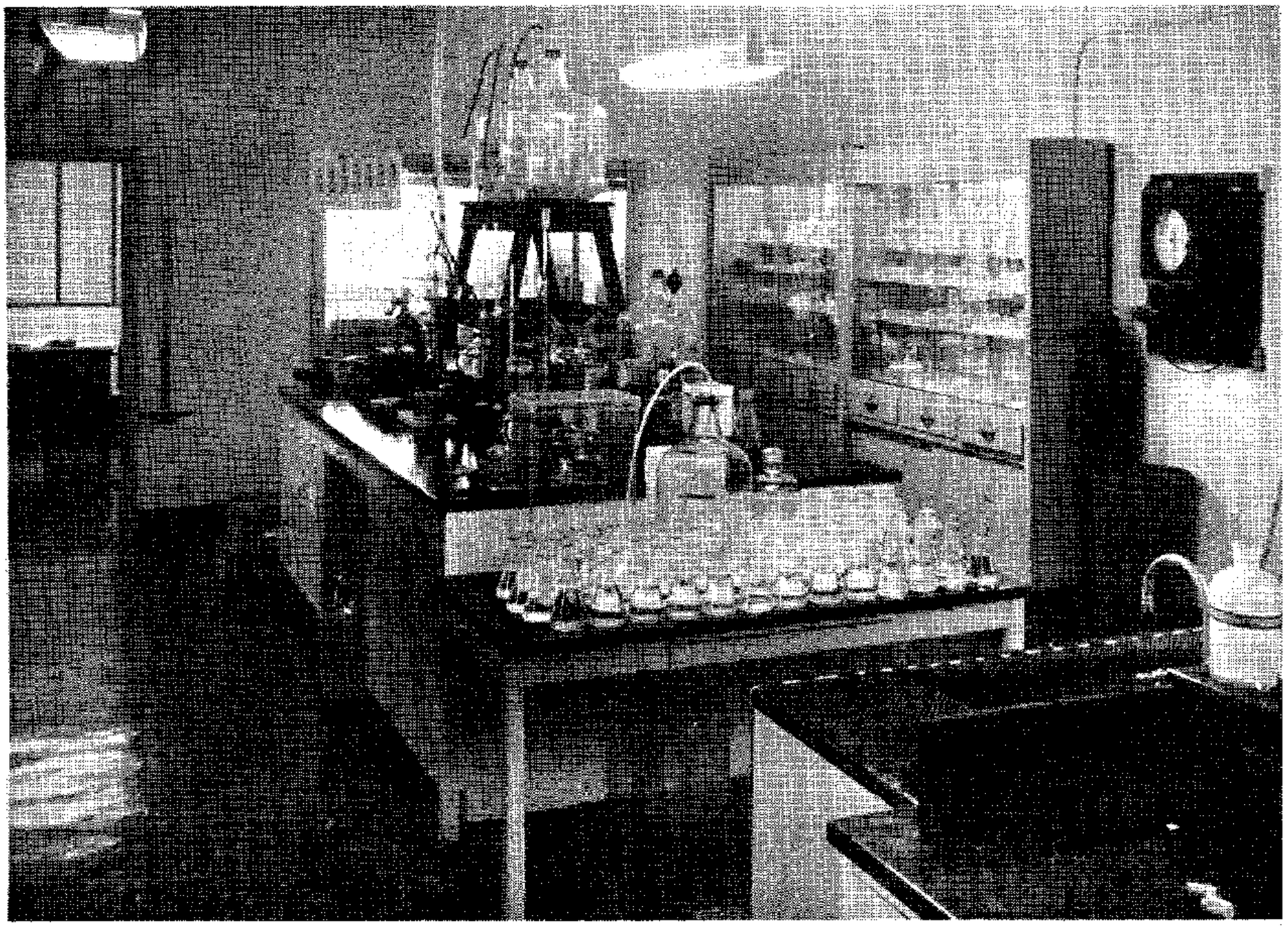
A *recirculating sea-water system* (Building D) was completed in 1961. The system holds over 60,000 gallons of sea water which is carefully monitored for pH, temperature, salinity, and nitrates so that fresh sea water can be added as required. The ceiling and walls are well insulated with glass wool and styrofoam, and air-conditioning maintains a steady temperature. To avoid metal contamination the sea water comes in contact only with concrete, glass, plastic piping, fiberglass, and redwood.

The laboratory serves two purposes. One is to hold quantities of various fishes

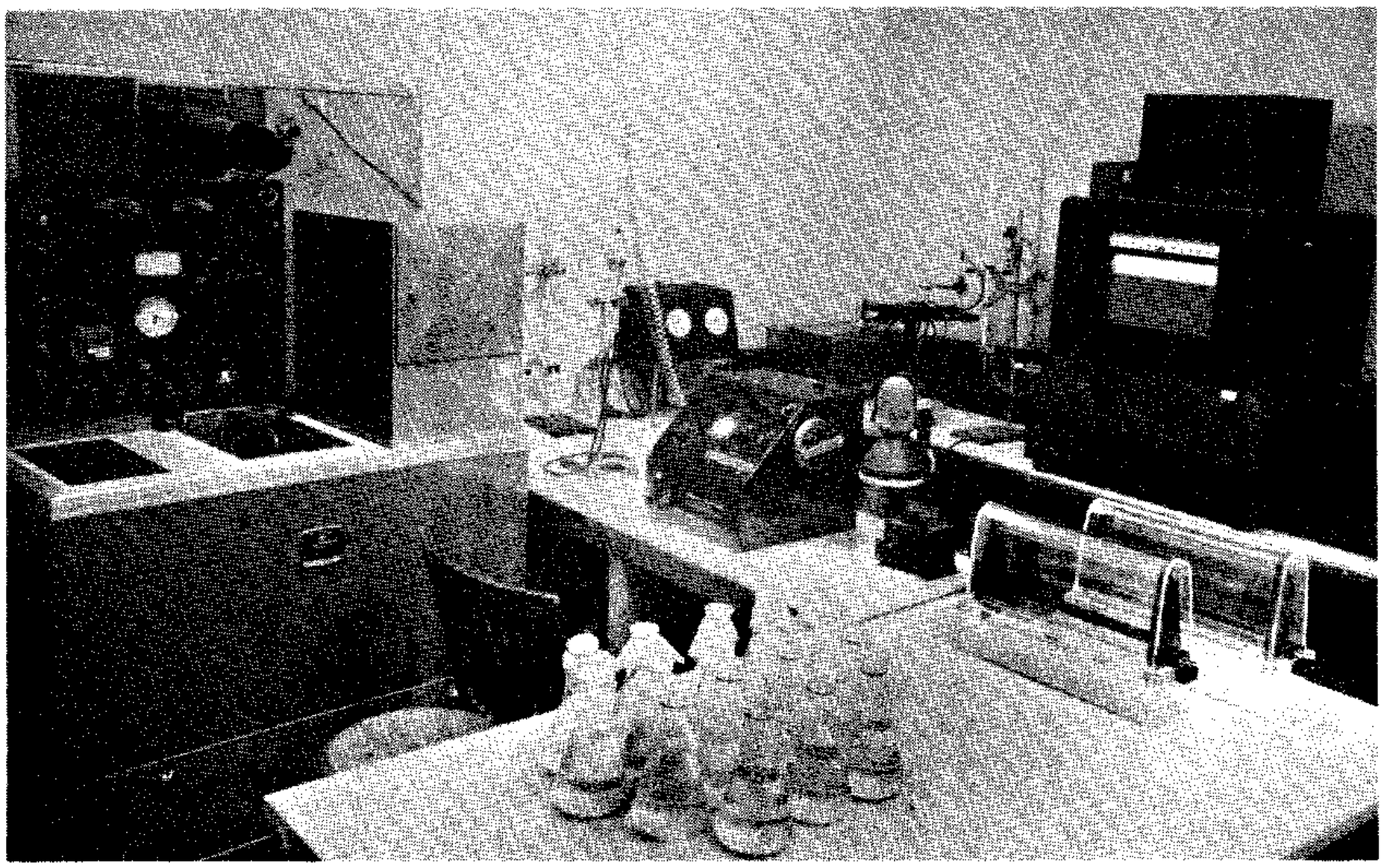


Plan of building C, the chemistry laboratory.

and invertebrates needed from time to time in other laboratories for physiological and behavioral studies and bioassays of toxic materials. The second purpose is to provide aquarium space for observations and experiments of a varied nature in the sea-water laboratory itself. Thus, mature shrimp of several species have been held for spawning and the ensuing larval stages



General view of the main chemistry laboratory.



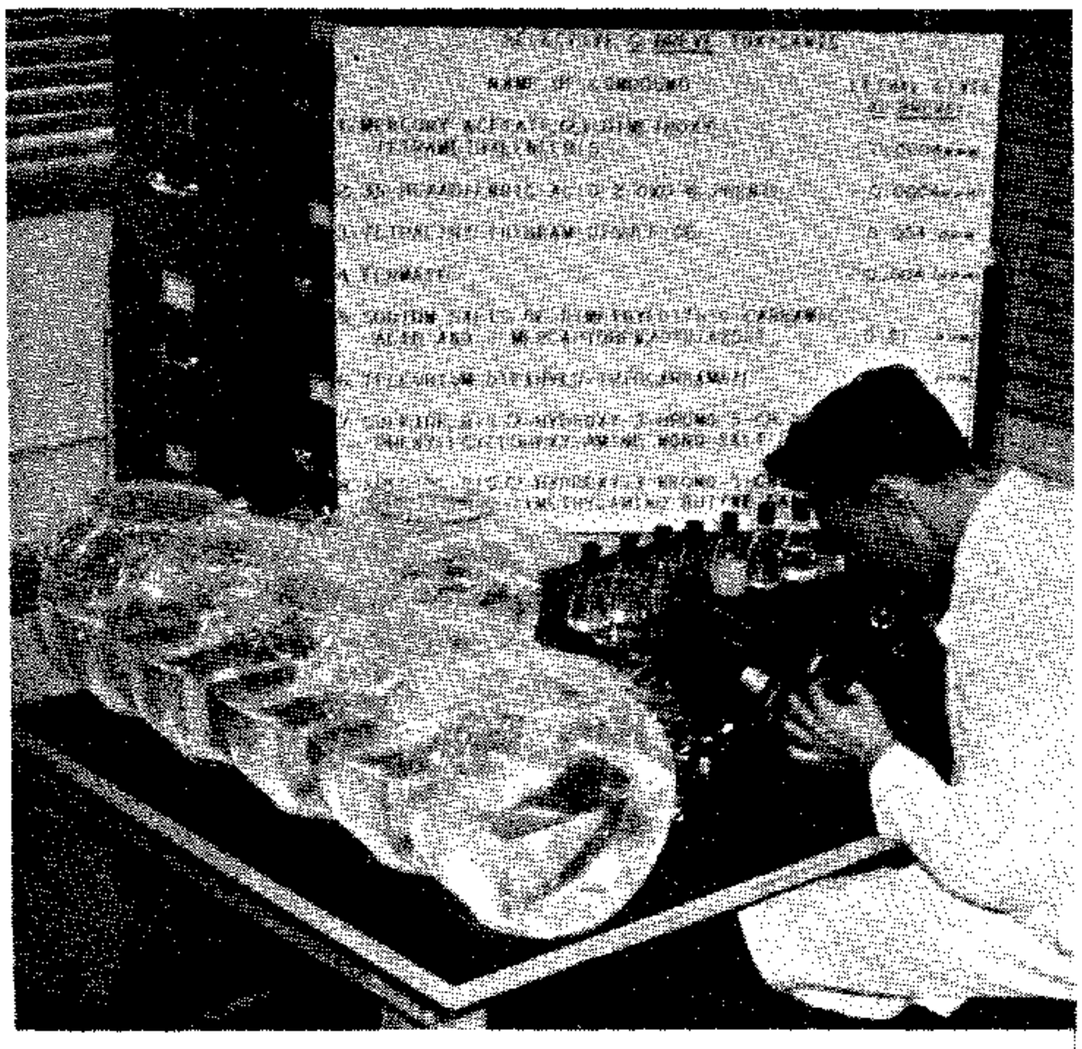
Temperature-controlled instrument room in the chemistry laboratory showing recording spectrophotometers and electrophoresis apparatus.

examined and described. Many refinements of shrimp-marking techniques are being tested in the tanks. Other studies are being scheduled as space permits.

The lower floor of Building B contains several laboratories. The *shrimp spawning and larvae laboratory* is used chiefly in studying the distribution and abundance of shrimp larvae and of the adult spawning populations. Here is where extensive field collections are studied. Ovary samples are sectioned, stained, and examined to determine stages of maturity. Samples of phytoplankton taken at the mouths of passes are examined and the postlarval shrimp enumerated to determine oceanic survival to the postlarval stage.

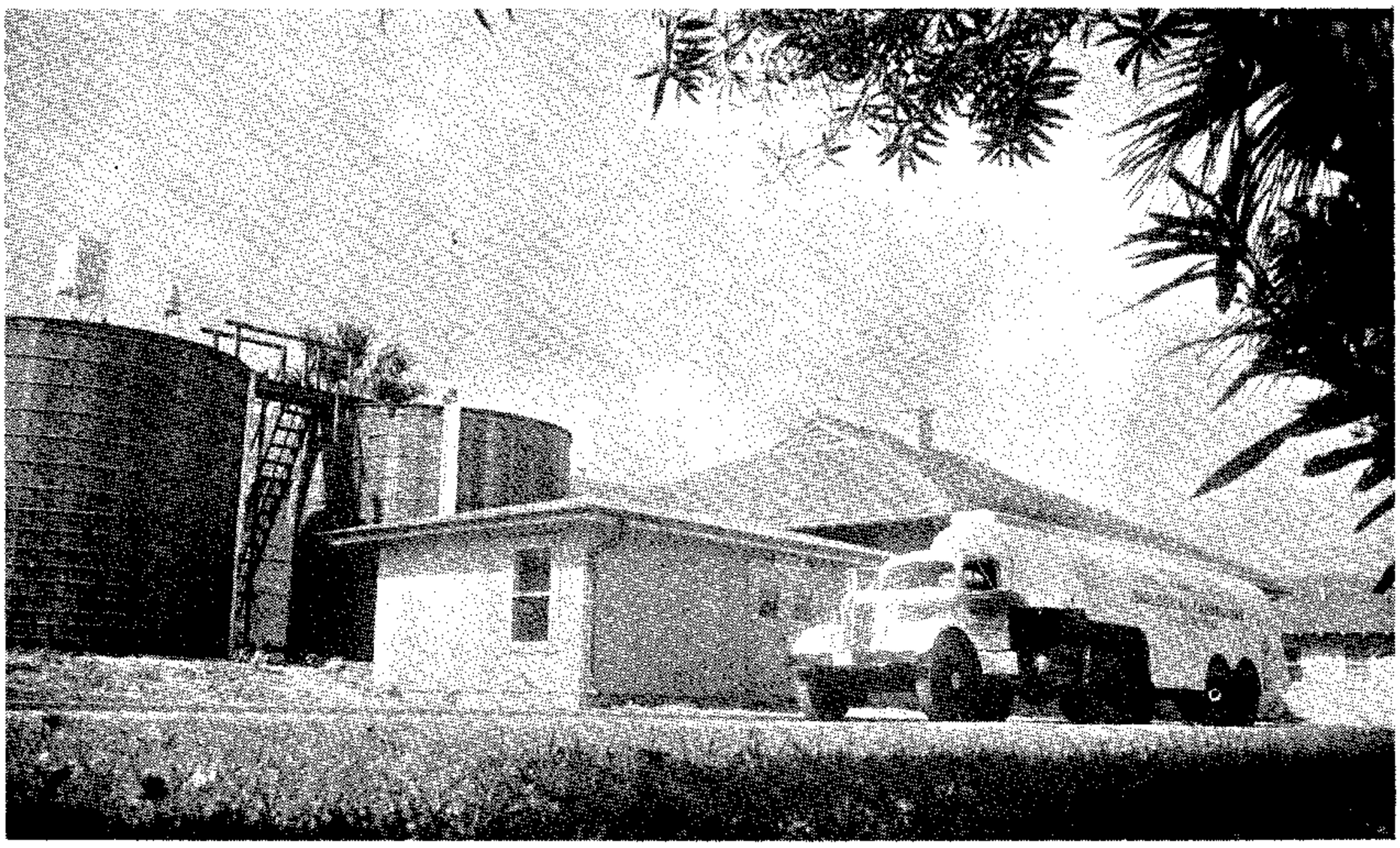
In the *plankton laboratory* offshore plankton collected with the Gulf V sampler are examined for larval shrimp and other forms under the plankton sorting hood which carries away the fumes of the preservatives. This laboratory is also used as a staging center to concentrate gear and equipment in preparation for each offshore cruise.

The *larval identification laboratory* is used for examining and describing the many larval stages of the several species of shrimp found in these waters.

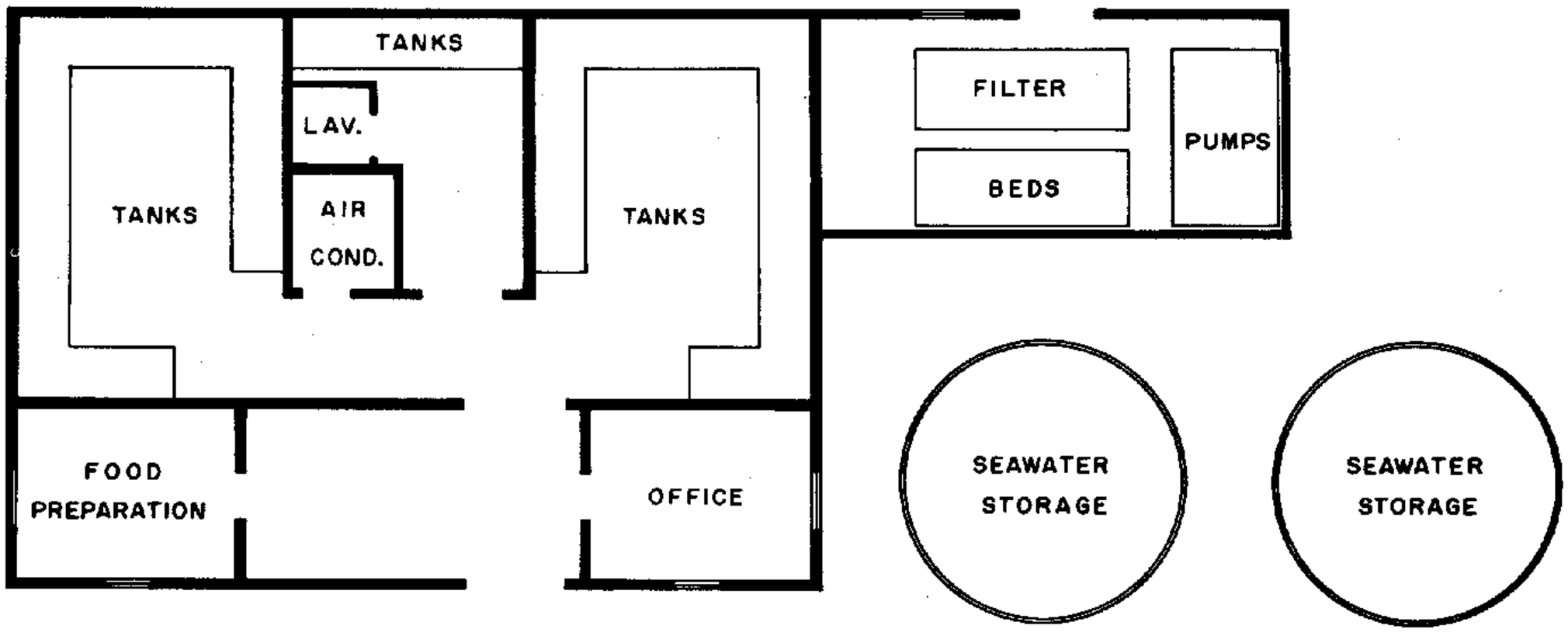


Making bioassays of various chemicals in search of one specifically toxic to the red-tide organism but harmless to valuable marine organisms.

In the *hydrographic laboratory* extensive series of hydrographic data from the offshore cruises are analyzed. This includes recovered drift bottles and seabed drifters released at widely scattered offshore stations in an endeavor to determine the currents at various depths.



General view of recirculating sea-water system (Building D) showing storage tanks, pump house, and sea-water truck.



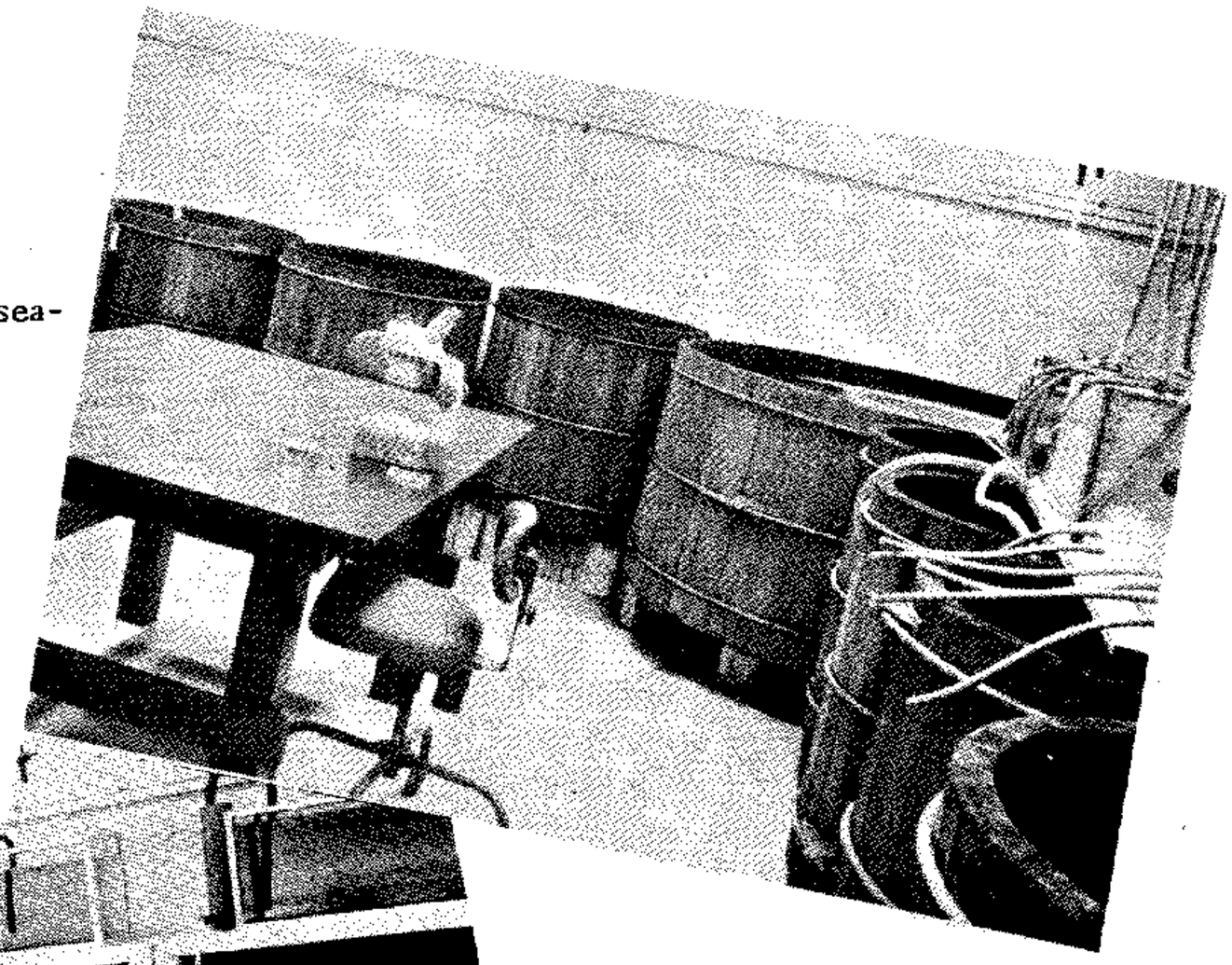
Plan of building D. The three tank rooms contain 885 square feet. The two storage tanks hold 56,000 gallons of sea water which flows by gravity into the tank rooms, thence through the filter beds into an underlying 9,000-gallon sump from which it is pumped up into the storage tanks.

A portion of the collection of local fauna in the foyer of the recirculating sea-water laboratory.

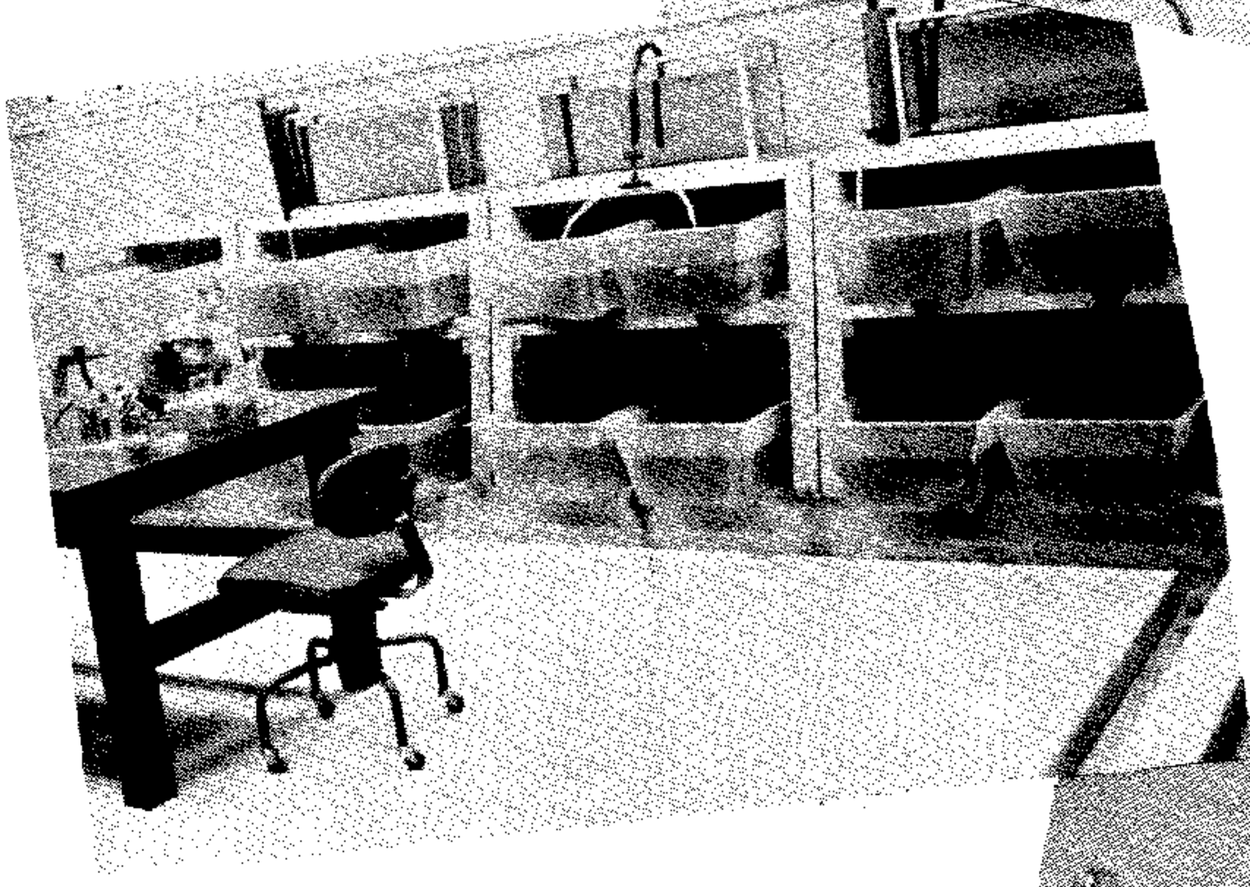
The *estaurine laboratory* is used to measure, count and examine, systematically collected biological samples from a wide variety of habitats, chiefly in Galveston and tributary bays. These studies are designed to evaluate and classify the various types of estuarine habitat in terms of growth and survival of the major species. Studies of the stomach contents of many fishes show their food habits and the role of predation in the complex biological relationships.

The upper floor of Building B contains offices, two laboratories, and a large room for meetings that overtax the capacity of the conference room.

The *biometrics laboratory* is for studies of population dynamics, especially of the important commercial species of shrimp. Studies of growth rates, and of total and natural mortality rates are made from information obtained from recoveries of stained and tagged shrimp. These estimated rates, in conjunction with population density estimates from the detailed statistics of the catches by species, size, depth, and fishing effort of the commercial fleet, permit the



Large holding tanks in the recirculating sea-water laboratory.



Tiers of small specimen tanks in the recirculating sea-water laboratory.

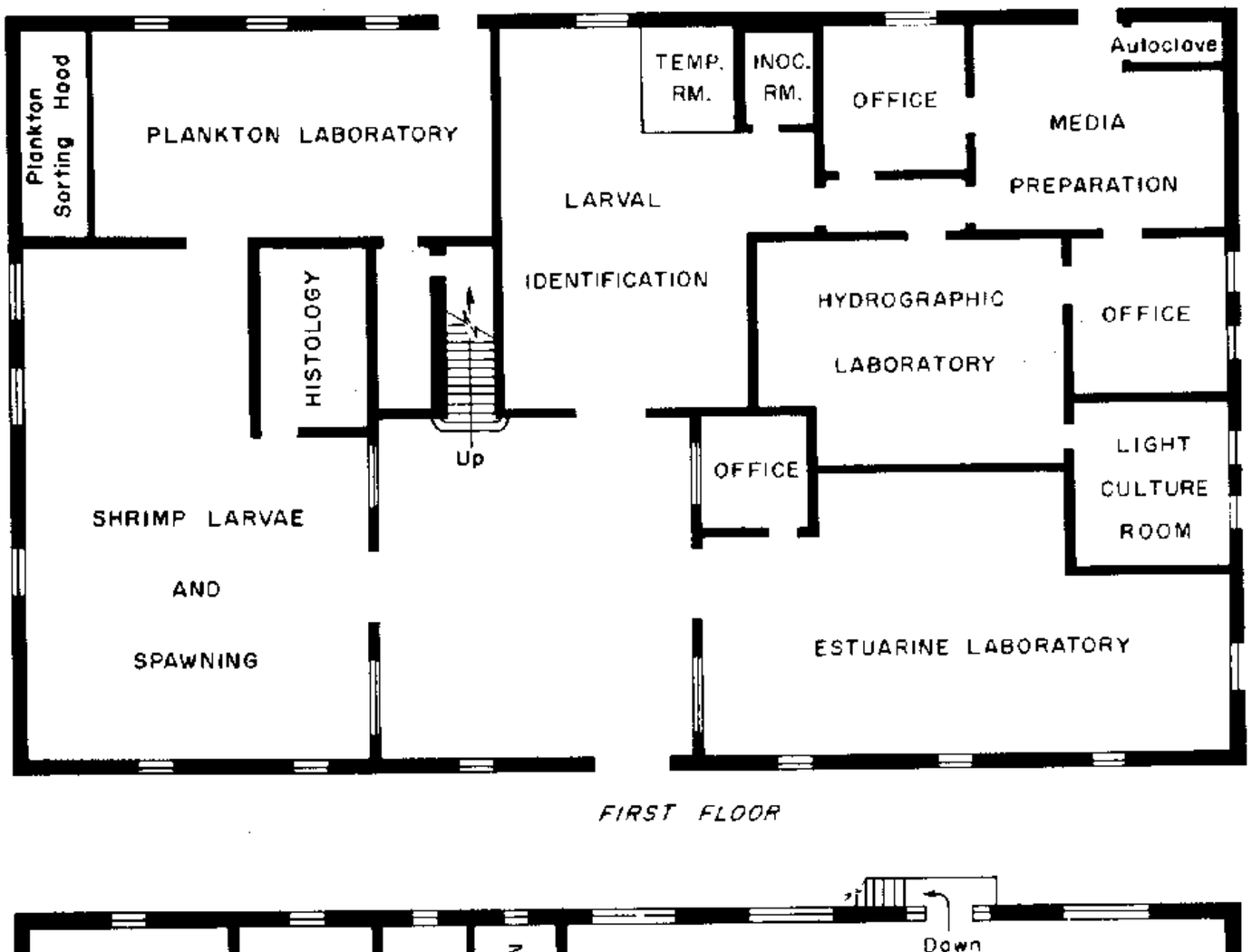
Staining live shrimp with vital stains so after release they can be identified when recaptured, thus providing valuable knowledge of growth and mortality rates, and migration routes.

making of estimates of harvestable crops under varied types of fishery management.

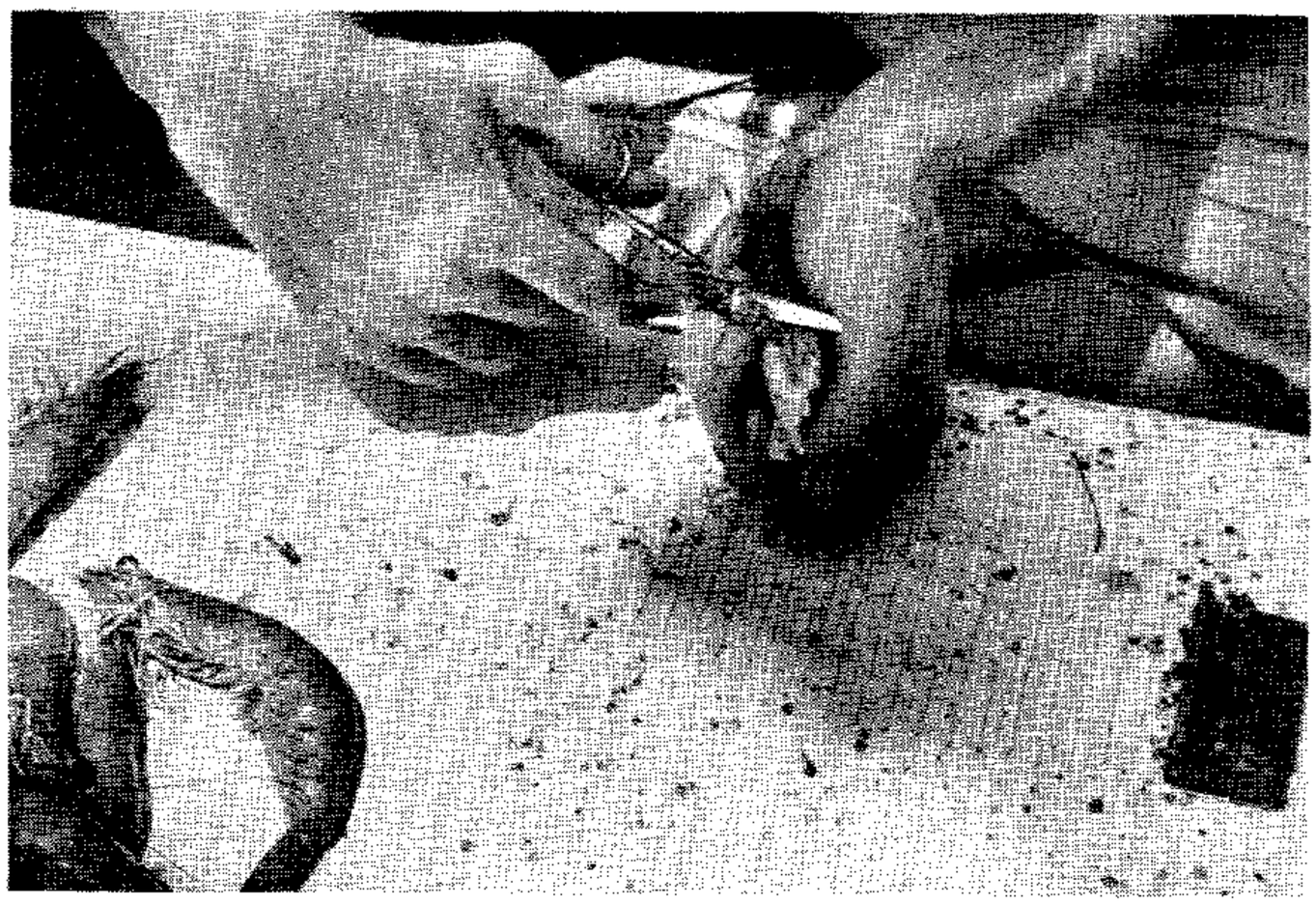
The *engineering projects* laboratory is for studying the effects on the estuarine fauna of various types of engineering projects, such as dredging channels and forming banks with the resulting material, bulkheading, filling, draining, and changing of stream flows by upriver dams, by the interbasin transfer of water, and by increased water consumption. These projects often have a significant effect on animal and plant life through the resulting changes in salinities, depths, currents, and turbidity.

East Lagoon field station outside of the Galveston seawall is built over a lagoon which connects with the ship channel into Galveston Bay. The building rests on a 40- by 90-foot concrete slab, elevated to 18 feet above mean sea level on prestressed concrete pilings. The structure withstood "Hurricane Carla" without damage.

Since the field station is situated on a 140-acre tract, natural conditions may be easily maintained, and there is ample space for making ponds as they are needed. The station, completed in 1962, has two 500-gallon-per-minute pumps that empty into two concrete tanks on the roof which connect with a long concrete flume along one edge of the roof. From here the sea water flows by gravity through polyvinylchloride piping under the ceiling of the tank room.

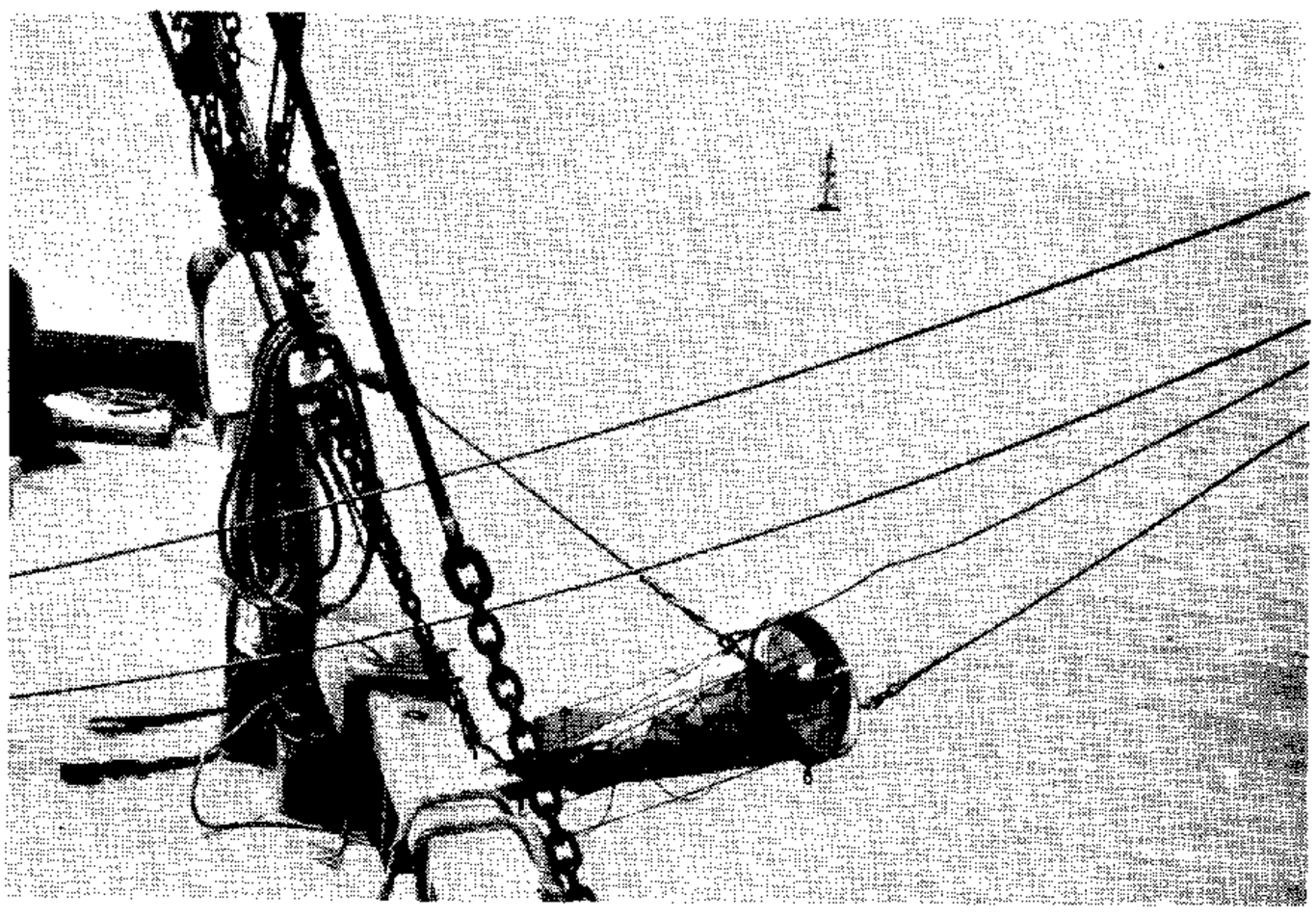


Plan of building B. The first floor contains 3,810 square feet of laboratory space and 364 square feet of office space. On the second floor, two laboratories have 960 square feet and three offices, 602 square feet. The meeting room is used for larger scientific and industrial meetings.

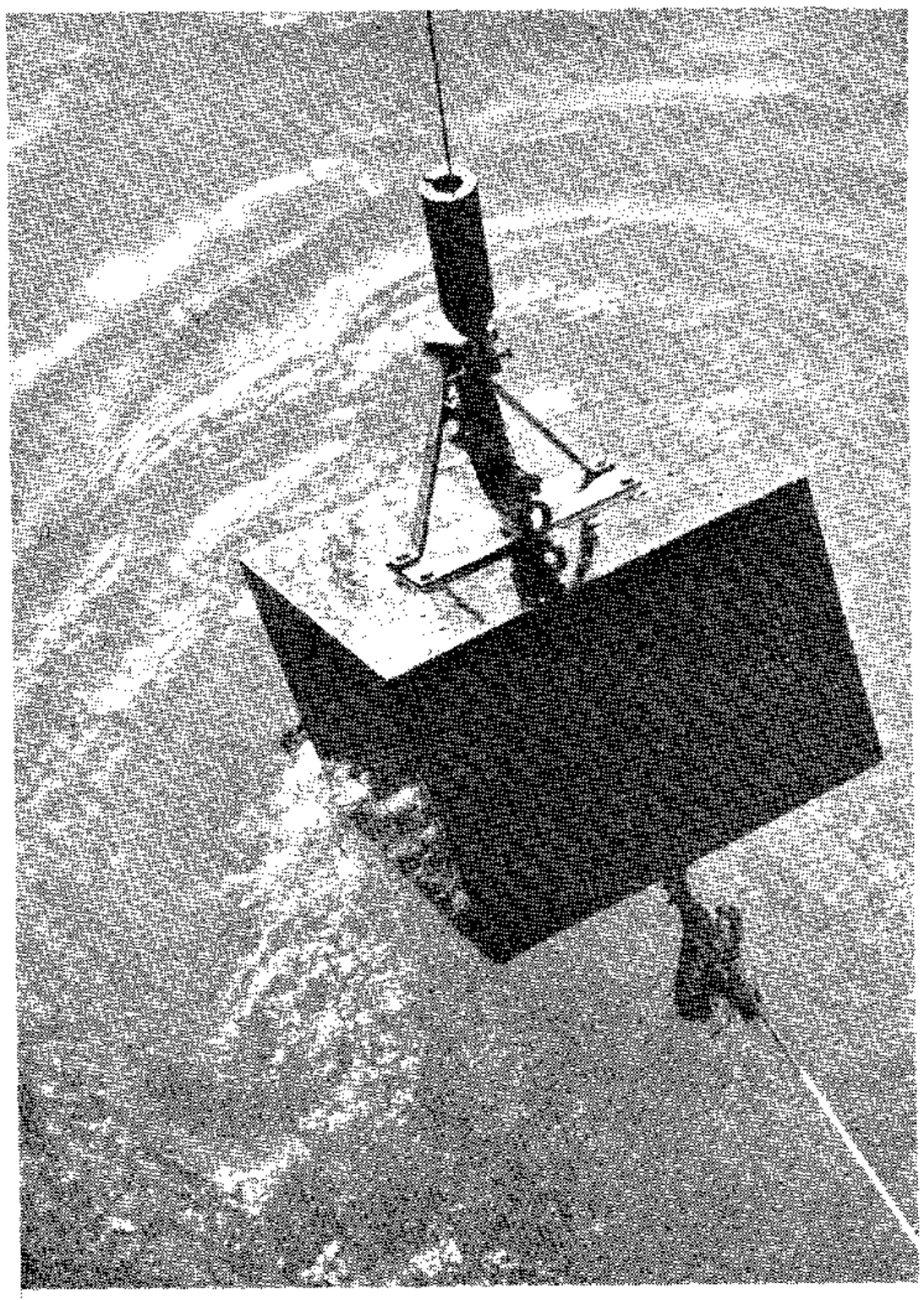


Taking samples of shrimp ovaries aboard a chartered shrimp trawler at sea.

Sectioning imbedded portion of shrimp ovaries to determine stages of maturity.



Gulf V high-speed plankton sampler. The net is fine monel metal screen.



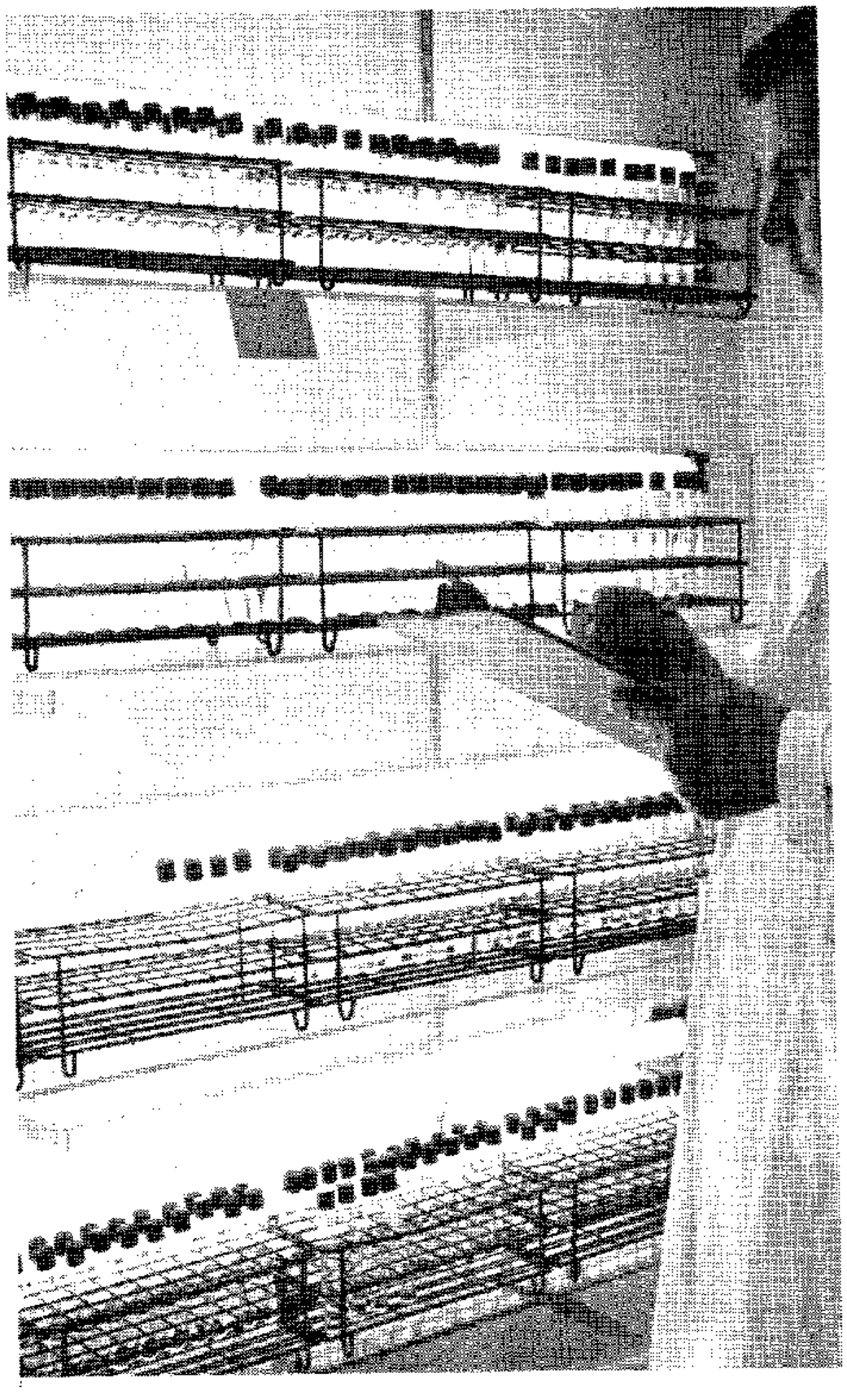
Messenger-actuated release box for lowering stained shrimp to the bottom. Shrimp released on the bottom quickly burrow into the sand, escaping the heavy predation that occurs when released at the surface.

In addition to the running sea-water system for experimental work, the laboratory serves as a base station for monitoring environmental conditions so that eventually we will be able to compare long-term seasonal and annual trends and assess their effects on the biota. Factors which are being monitored by continuously recording instruments include:

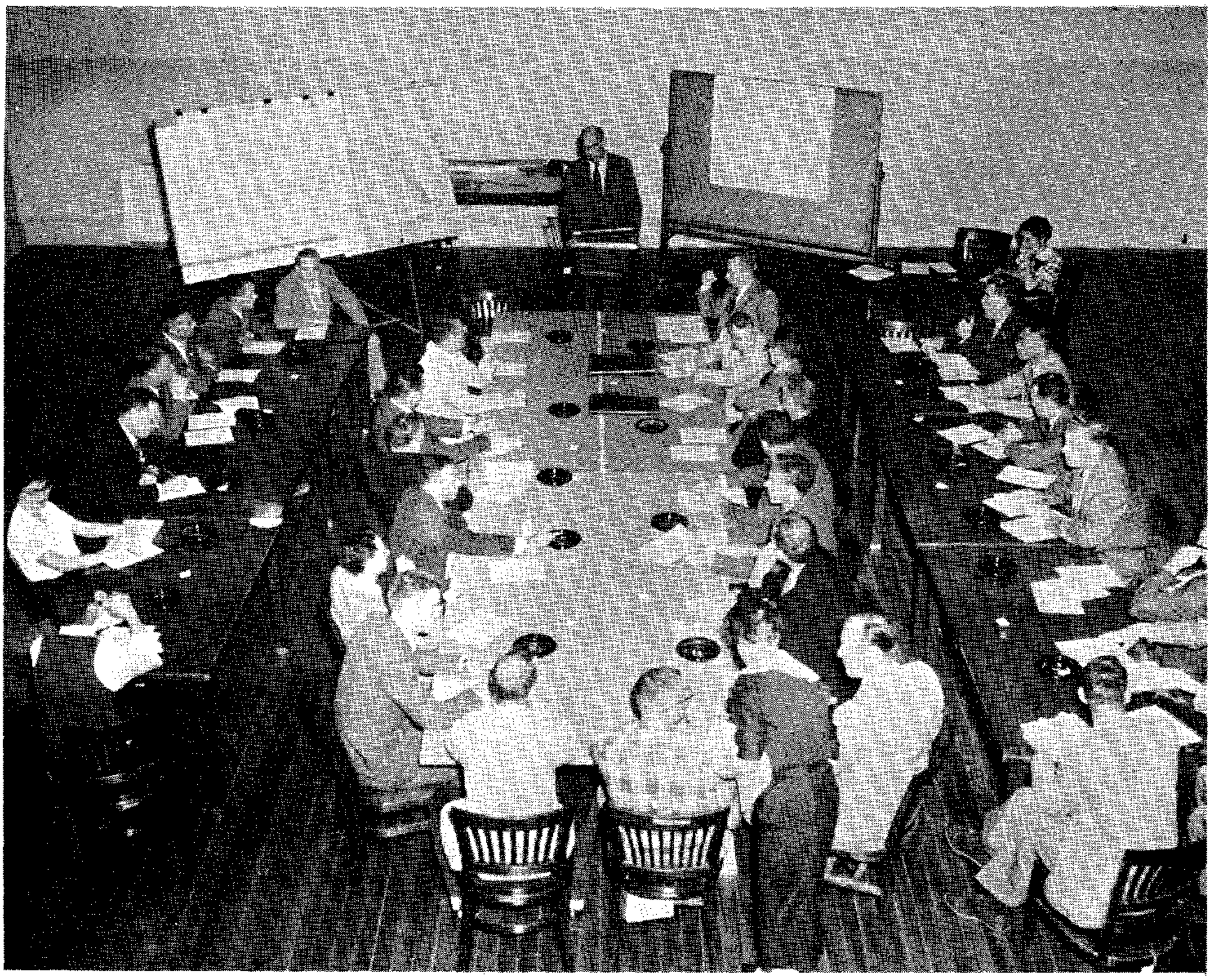
Wind speed and direction
Rainfall
Tide levels
Air temperature
Sea-water temperature
Dissolved oxygen
Hydrogen ion concentration
Humidity
Barometric pressure
Solar radiation
Salinity
Turbidity

Floating equipment is essential. The extensive system of estuaries, lagoons, and marshes behind the fringing barrier islands require shallow-draft vessels. For the larger bays the TOMMY BOX, a 40-foot diesel-powered vessel permits all-weather operation. For shallower areas, a 17-foot, Fibreglas "Boston Whaler" with a 75-hp. outboard motor is fast and stable. Assorted smaller boats and outboards are available.

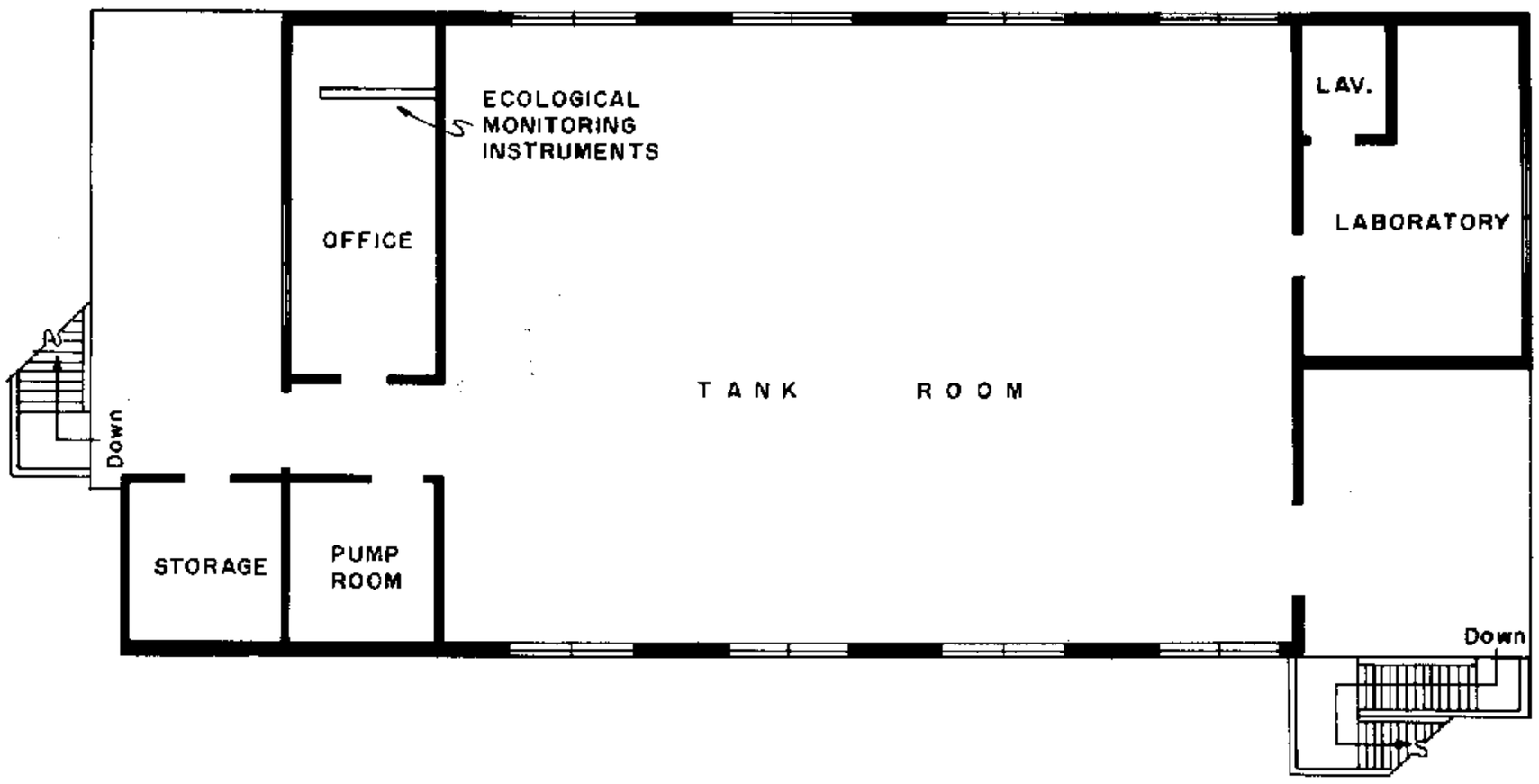
For extensive offshore work on the Continental Shelf, the laboratory has covered the area from the Rio Grande to the Mississippi River using chartered shrimp fishing vessels. They are suitable for otter trawling and for limited hydrographic observations. For work requiring several personnel in addition to the crew, as marking of shrimp at sea, biological examination of living material, or use of many of



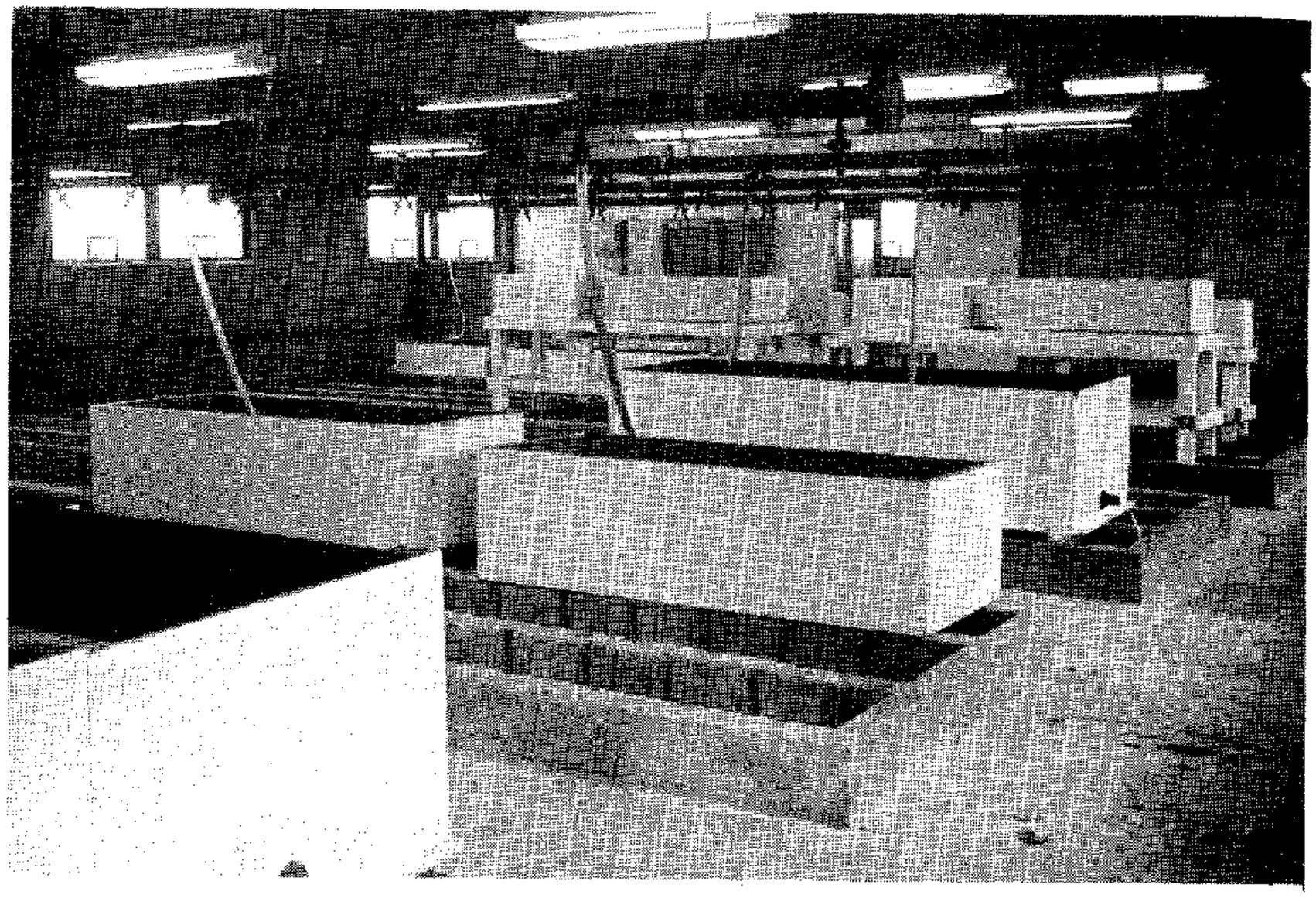
Growing marine protozoa in the light culture room.



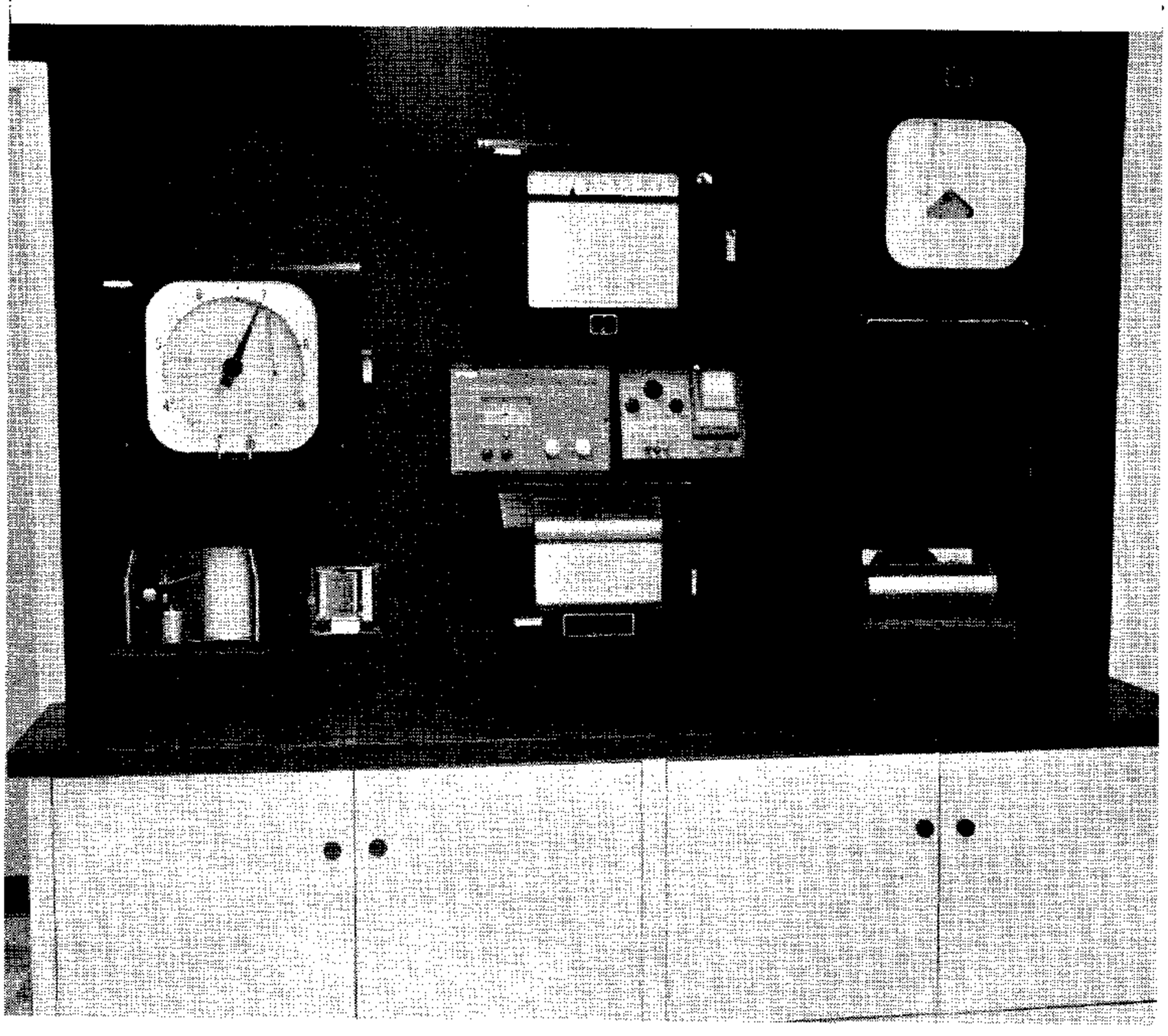
A discussion of scientific problems in the large meeting room of building B.



Plan of the East Lagoon field station (picture on back cover). The tank room is 40 feet wide and 56 feet long. From large concrete roof tanks, sea water flows through five plastic ceiling pipes each extending 30 feet across the width of the tank room.



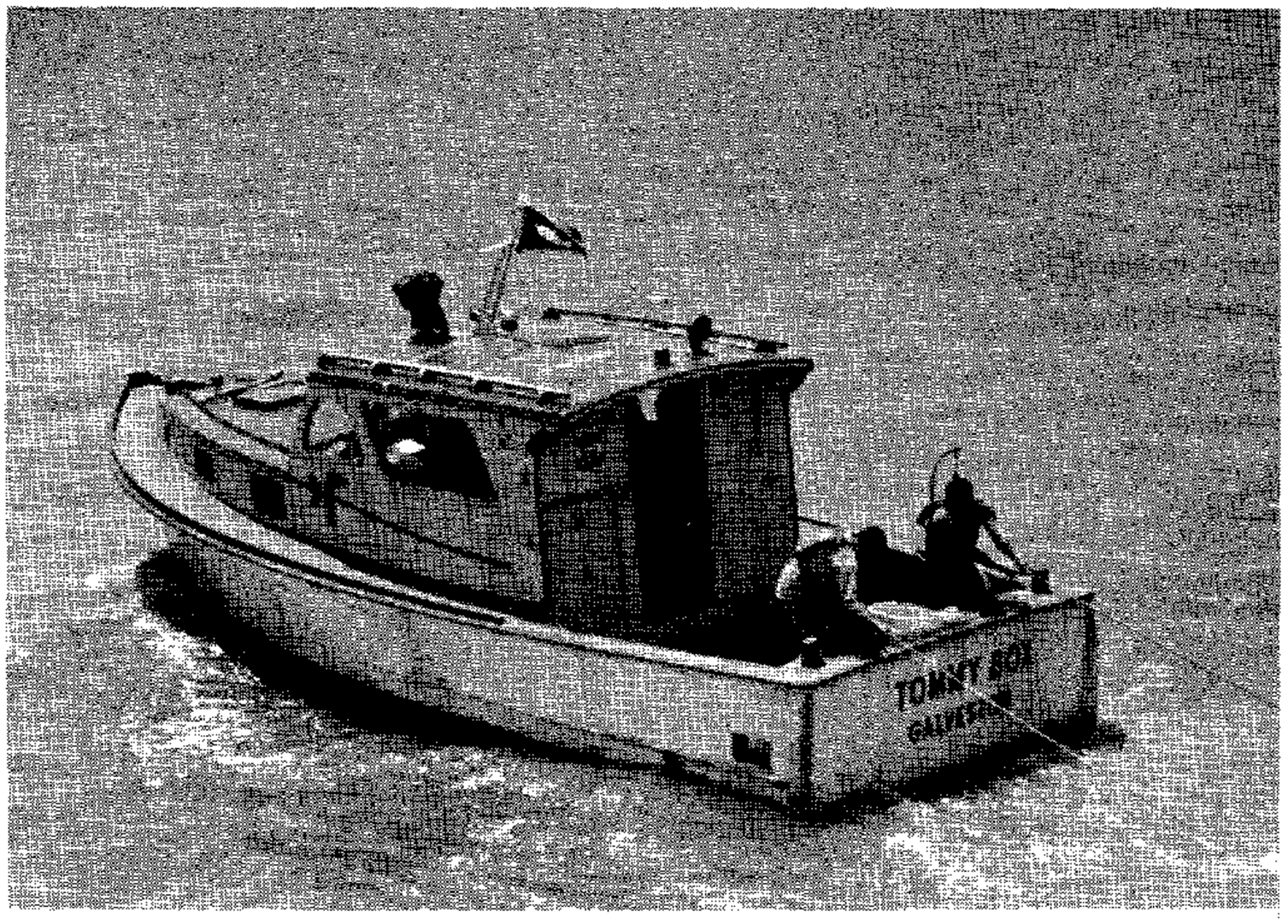
The sea-water tank room in the East Lagoon field station.



Instrument panel showing recorders for environmental monitoring instruments in the East Lagoon field station.

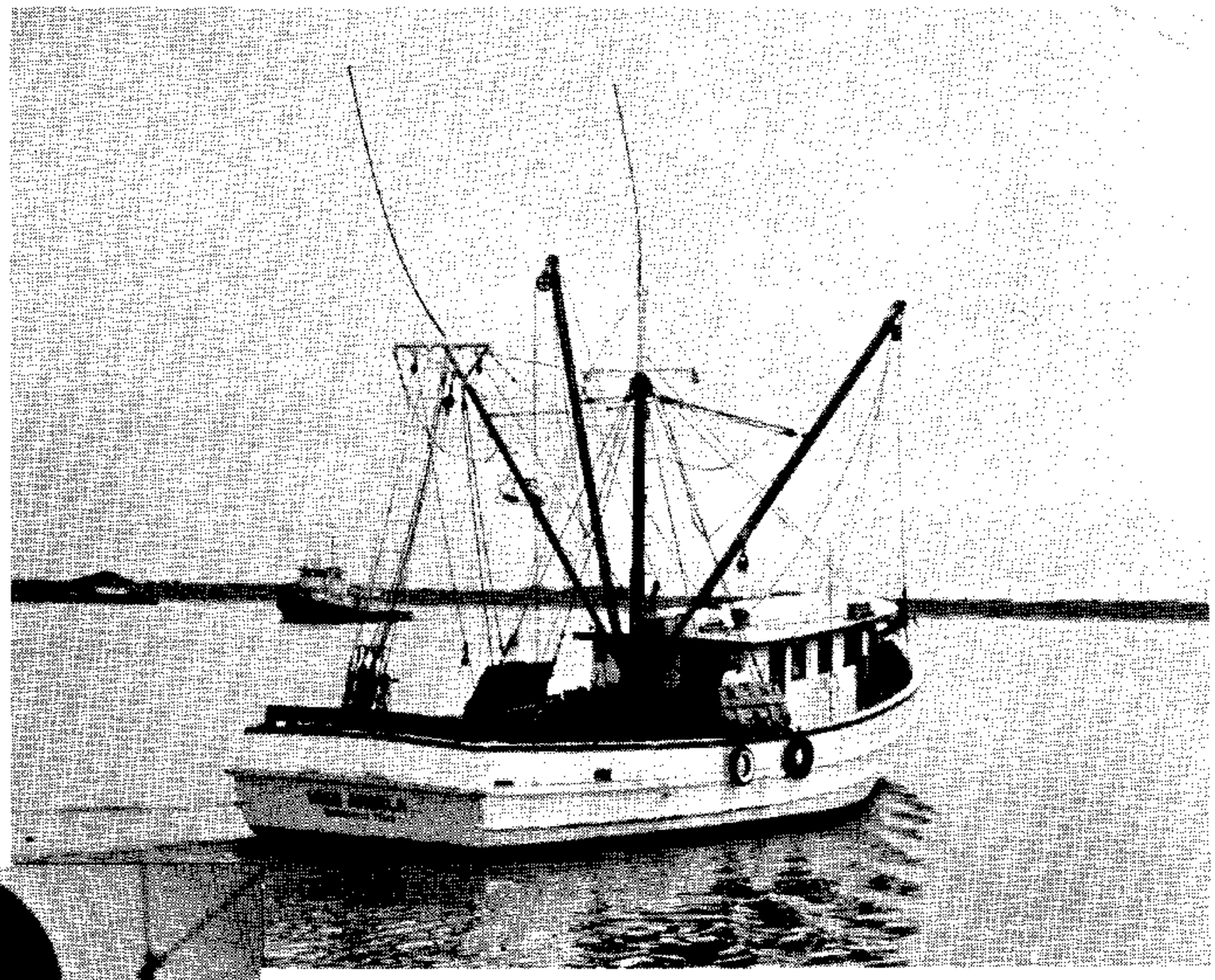
the more sophisticated oceanographic instruments, the chartered boats do not provide adequate quarters, laboratory space, or winches. Future laboratory plans include a small oceanographic vessel to fill these voids.

The laboratory welcomes full use of the many available facilities. Arrangements may be made for a limited number of visiting investigators as space permits. The only stipulations are that the research be upon some aspect of marine biology or oceanography and that the Bureau receive copies of resulting reports or publications. Write to the Laboratory Director, Bureau of Commercial Fisheries Biological Laboratory, Fort Crockett, Galveston, Tex., for any further information on facilities and arrangements.



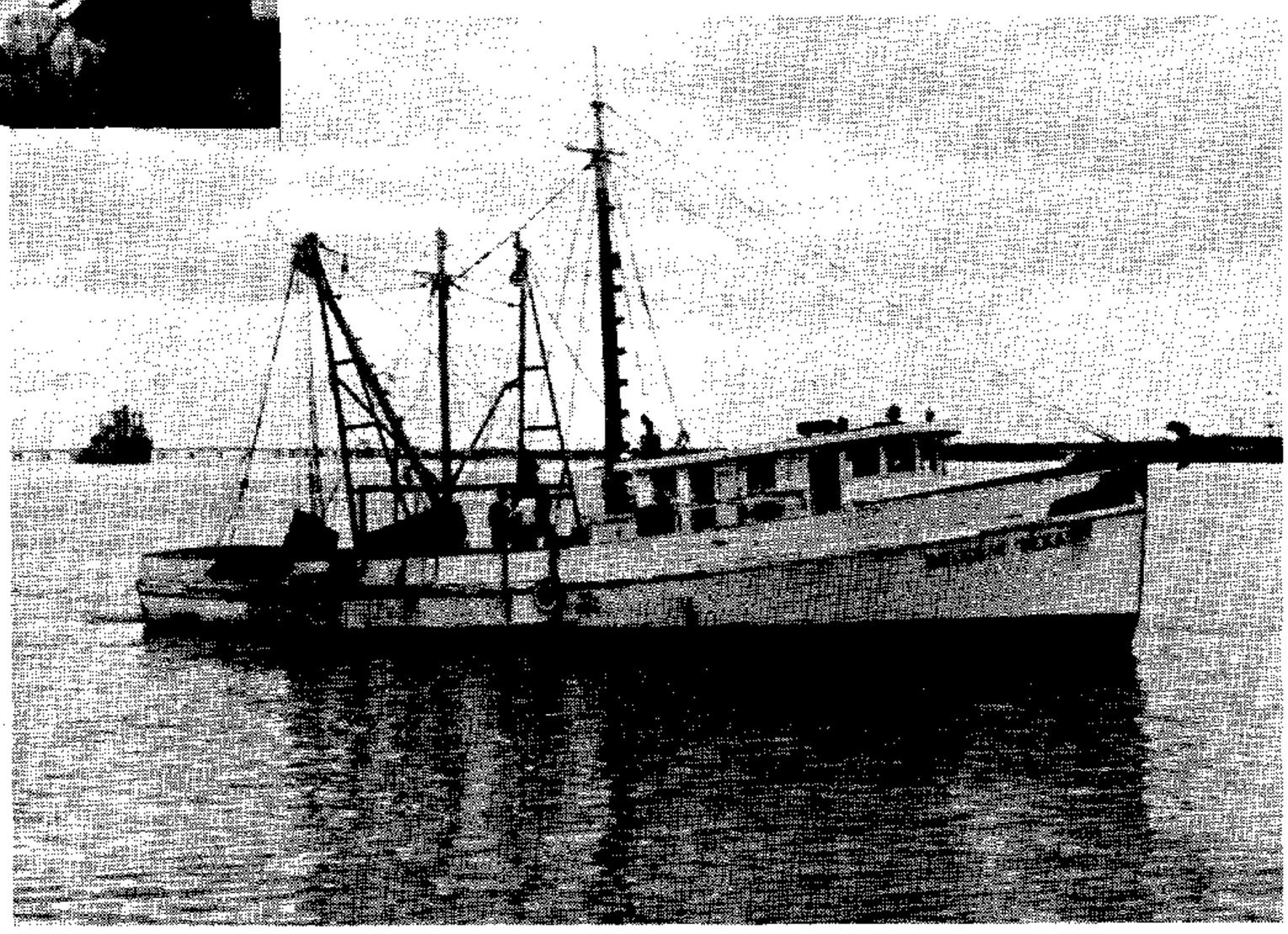
Otter trawling in shallow waters from a laboratory vessel.

Collecting estuarine samples from a skiff.

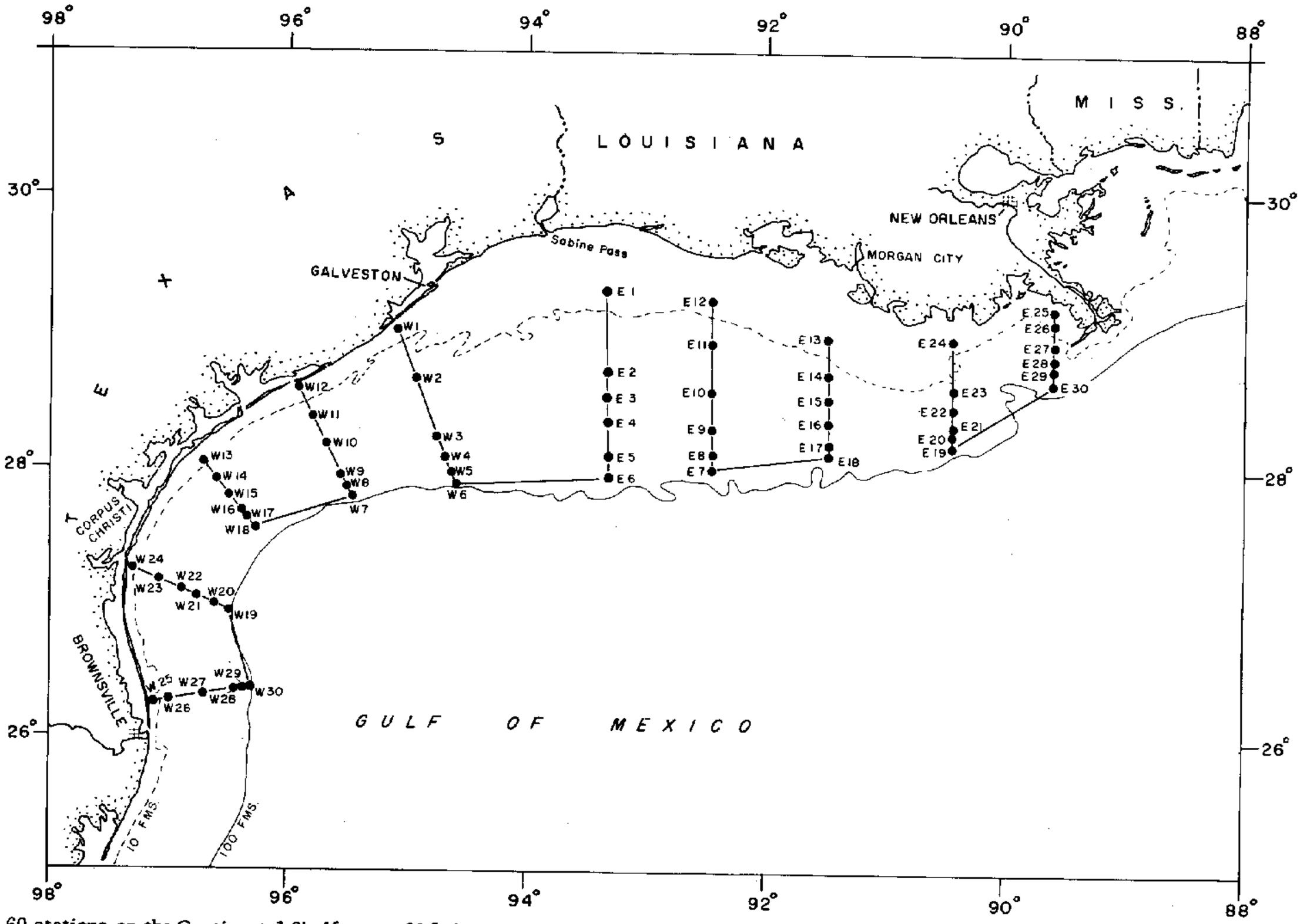


The shrimp trawler MISS ANGELA chartered for taking biological and hydrographic observations on the Continental Shelf.

Field party chief using sextant to accurately determine station locations at sea.



The shrimp trawler BELLE OF TEXAS chartered for taking biological and hydrographic observations on the Continental Shelf.



These 60 stations on the Continental Shelf out to 60 fathoms are visited every month in an intensive study of the fauna of the shelf area and the effects on abundance of the associated hydrographic conditions.

PUBLISHED CONTRIBUTIONS

This is a list of all published reports by the Bureau of Commercial Fisheries Biological Laboratory in Galveston and its predecessor organizations.

It includes all biological reports by Service personnel during the period since 1927 on the Gulf of Mexico, exclusive of work done at the Sabine Island (Gulf Breeze, Fla.) Laboratory. It also includes material published by staff members on fishes outside the Gulf of Mexico in which the major share of the work was accomplished while staff members of this organization. Publications resulting from work performed for the Bureau under contract are marked with an asterisk. Names of laboratory personnel are underlined for reports coauthorized with others.

1. Higgins, Elmer, and Russell Lord.
   1927. Preliminary report on the marine fisheries of Texas. Report of the U.S. Commissioner of Fisheries, 1926, Appendix IV, p. 167-199.

2. Pearson, John C.
   1929. Natural history and conservation of redfish and other commercial sciaenids on the Texas coast. Bulletin of the U.S. Bureau of Fisheries, vol. 44, p. 129-214.

3. Hopkins, Aubrey E.
   1931. Factors influencing the spawning and setting of oysters in Galveston Bay, Texas. Bulletin of the U.S. Bureau of Fisheries, vol. 47, no. 3, p. 57-83.

4. Higgins, Elmer.
   1931. Federal bureau and State governments cooperate in shrimp investigations. Louisiana Conservation Review, vol. 1, no. 7, p. 2-5.

5. Higgins, Elmer.
1932. Federal and State investigation of the shrimp progresses. Louisiana Conservation Review, vol. 2, no. 11, p. 30-33.

6. Weymouth, Frank W., Milton J. Lindner, and William W. Anderson.
1932. A summary of the life history of the common shrimp *(Penaeus setiferus)* of the South Atlantic and Gulf coasts of the United States. Transactions of the American Fisheries Society, vol. 62, p. 108-110.

7. Lindner, Milton J.
1933. Progress in shrimp investigations during the year 1932. Louisiana Conservation Review, vol. 3, no. 2, p. 50-53, 56.

8. Weymouth, F. W., Milton J. Lindner, and W. W. Anderson.
1933. Preliminary report on the life history of the common shrimp *Penaeus setiferus* (Linn.). Bulletin of the U.S. Bureau of Fisheries, vol. 48, no. 14, p. 1-26.

9. Higgins, Elmer.
1934. A story of the shrimp industry. Scientific Monthly, vol. 38, p. 429-443.

10. Johnson, Fred F., and Milton J. Lindner.
1934. Shrimp industry of the South Atlantic and Gulf States with notes on other domestic and foreign areas. U.S. Bureau of Fisheries, Investigational Report No. 21, 83p.

11. Pearson, John C.
1935. Eggs of a peneid shrimp. Science, vol. 82, no. 2121, p. 172.

12. Lindner, Milton J.
1936. Suggestions for the Louisiana shrimp fishery. Biennial Report of the Bureau of Scientific Research and Statistics, Louisiana Department of Conservation, 1934-1935, p. 53-69.

13. Lindner, Milton J.
1936. A discussion of the shrimp trawl-fish problem. Louisiana Conservation Review, vol. 5, no. 4, p. 12-17, 51.

14. Mosher, Kenneth H.
1936. Digest of "Preliminary Work on Problems of Shrimp Investigation." [Abstract.] Transactions of the Texas Academy of Science, 1934-1935, together with the Proceedings for the same time, vol. 19, p. 24.

15. Mosher, Kenneth H.
1937. The shrimp and the shrimp fishery of Texas. [Abstract.] Proceedings of the Texas Academy of Science, vol. 20, p. 16.

16. Lindner, Milton J.
1938. The cooperative shrimp investigations. Biennial Report, Louisiana Department of Conservation, 13th, 1936-1937, p. 446-455.

17. Pearson, John C.
1939. The early life histories of some American Penaeidae, chiefly the commercial shrimp, *Penaeus setiferus* (Linn.). Bulletin of the U.S. Bureau of Fisheries, vol. 49, no. 30, p. 1-73.

18. Lindner, Milton J.
1940. Biennial report, shrimp investigations. Biennial Report, Louisiana Department of Conservation, 14th, 1938-1939, p. 389-399.

19. Anderson, William W., and Milton J. Lindner.
1941. Notes on the flatfish *Engyophrys sentus* Ginsburg. Copeia, 1941, no. 1 (March), p. 23-27.

20. Lindner, Milton J.
1941. The Texas fisheries. In J. L. Baughman, An annotated bibliography for the student of Texas fishes and fisheries, with material on the Gulf of Mexico and the Caribbean Sea, p. 132-149. (Mimeographed report.)

21. Lindner, Milton J., and William W. Anderson.
1941. A new *Solenocera* and notes on the other Atlantic American species. Journal of the Washington Academy of Sciences, vol. 31, no. 5, p. 181-187.

22. Anderson, William W., and Milton J. Lindner.
1943. A provisional key to the shrimps of the family Penaeidae with especial reference to American forms. Transactions of the American Fisheries Society, vol. 73, p. 284-319.

23. Galtsoff, Paul S.
1948. Red tide; progress report on the investigations of the cause of the mortality of fish along the west coast of Florida conducted by the U.S. Fish and Wildlife Service and Cooperating Organizations. U.S. Fish and Wildlife Service, Special Scientific Report No. 46, 44 p.

24. King, Joseph E.
1948. A study of the reproductive organs of the common marine shrimp, *Penaeus setiferus* (Linnaeus). Biological Bulletin, vol. 94, no. 3, p. 244-262.

25. U.S. Fish and Wildlife Service.
1948. The shrimp and the shrimp industry of the South Atlantic and Gulf of Mexico. U.S. Fish and Wildlife Service, Fishery Leaflet 319, 5 p.

26. Anderson, William W.
1949. Some problems of the shrimp industry. Proceedings of the Gulf and Caribbean Fisheries Institute, Inaugural Session, 1948, p. 12-14.

27. Anderson, William W., Joseph E. King, and Milton J. Lindner.
1949. Early stages in the life history of the common marine shrimp, *Penaeus setiferus* (Linnaeus). Biological Bulletin, vol. 96, no. 2, p. 168-172.

28. Galtsoff, Paul S.
1949. The mystery of the red tide. Scientific Monthly, vol. 68, no. 2, p. 108-117.

29. U.S. Fish and Wildlife Service.
1949. Keeping live shrimp for bait. U.S. Fish and Wildlife Service, Fishery Leaflet 337, 2 p.

30. King, Joseph E.
1950. A preliminary report on the plankton of the west coast of Florida. Quarterly Journal of the Florida Academy of Sciences, vol. 12, no. 2, p. 109-137.

31. Arnold, Edgar L., Jr.
1952. High speed plankton samplers. 1. A high speed plankton sampler (Model Gulf I-A). U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 88, p. 1-6.

32. Gehringer, Jack W.
1952. High speed plankton samplers. 2. An all metal plankton sampler (Model Gulf III.). U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 88, p. 7-12.

33. Wangersky, Peter J.
1952. Isolation of ascorbic acid and rhamnosides from sea water. Science, vol. 115, no. 2999, p. 685.

34. Collier, Albert W.
1953. The significance of organic compounds in sea water. Transactions of the 18th North American Wildlife Conference, p. 463-472.

35. Collier, Albert W.
1953. Titanium and zirconium in bloom of *Gymnodinium brevis* Davis. Science, vol. 118, no. 3064, p. 329.

36. Lindner, Milton J.
1953. Estimation of growth rate in animals by marking experiments. U.S. Fish and Wildlife Service, Fishery Bulletin 78, vol. 54, p. 65-69.

37. Collier, Albert W., and Kenneth T. Marvin.
1953. Stabilization of the phosphate ratio of sea water by freezing. U.S. Fish and Wildlife Service, Fishery Bulletin 79, vol. 54, p. 71-76.

38. Collier, Albert W., Sammy M. Ray, A. W. Magnitzky, and Joe O. Bell.
1953. Effect of dissolved organic substances on oysters. U.S. Fish and Wildlife Service, Fishery Bulletin 84, vol. 54, p. 167-185.

39. Howell, John F.
1953. *Gonyaulax monilata,* sp. nov., the causative dinoflagellate of a red tide on the east coast of Florida in August-September, 1951. Transactions of the American Microscopical Society, vol. 72, no. 2, p. 153-156.

40. Slobodkin, L. Basil.
1953. A possible initial condition for red tides on the coast of Florida. Journal of Marine Research, vol. 12, no. 1, p. 148-155.

41. Slobodkin, L. Basil.
1953. On social single species populations. Ecology, vol. 34, no. 2, p. 430-434.

42. Collier, Albert W.
1954. A study of the response of oysters to temperature, and some long range ecological interpretations. Papers delivered at the Convention of the National Shellfisheries Association, 1953, p. 13-38.

43. Galtsoff, Paul S.
1954. Gulf of Mexico, its origin, waters, and marine life. Prepared by American scientists under the sponsorship of the Fish and Wildlife Service, U.S. Department of the Interior. Coordinated by Paul S. Galtsoff. U.S. Fish and Wildlife Service, Fishery Bulletin 89, vol. 55, 604 p.

44. Graham, Herbert W.
1954. Dinoflagellates of the Gulf of Mexico. U.S. Fish and Wildlife Service, Fishery Bulletin 89, vol. 55, p. 223-226.

45. Graham, Herbert W., John M. Amison, and Kenneth T. Marvin.
1954. Phosphorus content of waters along the west coast of Florida. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 122, 43 p.

46. Lindner, Milton J., and William W. Anderson.
1954. Biology of commercial shrimps. U.S. Fish and Wildlife Service, Fishery Bulletin 89, vol. 55, p. 457-461.

47. Rounsefell, George A.
1954. Biology of the commercial fishes of the Gulf of Mexico. U.S. Fish and Wildlife Service, Fishery Bulletin 89, vol. 55, p. 507-512.

48. Sater, Edna N.
1954. Florida's red tide problem. U.S. Fish and Wildlife Service, Fishery Leaflet 420, 11 p.

49. Wangersky, Peter J.
1954. The spectrum of magnesium in concentrated sulfuric acid. Science, vol. 119, no. 3102, p. 850-851.

50. Arnold, Edgar L., Jr.
1955. Notes on the capture of young sailfish and swordfish in the Gulf of Mexico. Copeia, 1955, no. 2 (May), p. 150-151.

51. Lindner, Milton J.
1955. Some problems concerning the management of the shrimp fisheries. Proceedings of the Gulf and Caribbean Fisheries Institute, 7th Annual Session, 1954, p. 164-168.

52. Marvin, Kenneth T.
1955. Oceanographic observations in west coast Florida waters, 1949-52. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 149, 32 p.

53. Marvin, Kenneth T.
1955. Notes on the precision of a modified routine nitrate-nitrite analysis. Journal of Marine Research, vol. 14, no. 1, p. 79-87.

54. Wilson, William B., and Albert W. Collier.
1955. Preliminary notes on the culturing of *Gymnodinium brevis* Davis. Science, vol. 121, no. 3142, p. 394-395.

55. Anderson, William W.
1956. Observations upon the biology, ecology and life history of the common shrimp, *Penaeus setiferus* (Linnaeus), along the South Atlantic and Gulf coasts of the United States. S 3/11. Indo-Pacific Fisheries Council, Proceedings, 6th Session, Tokyo, Japan, 1955, Sections II and III, p. 399-403.

56. Backus, Richard H., Stewart Springer, and Edgar L. Arnold, Jr.
1956. A contribution to the natural history of the white-tip shark, *Pterolamiops longimanus* (Poey). Deep-Sea Research, vol. 3, p. 178-188.

57. Bullis, Harvey R., Jr., and Edgar L. Arnold, Jr.
1956. Capture of an immature oarfish, *Regalecus glesne*, in the Gulf of Mexico. Copeia, 1956, no. 3 (August), p. 191.

58. Collier, Albert W., Sammy M. Ray, and William B. Wilson.
1956. Some effects of specific organic compounds on marine organisms. Science, vol. 124, no. 3214, p. 220.

59. Fleminger, Abraham, and Thomas E. Bowman.
1956. A new species of *Candacia* (Copepoda: Calanoida) from the western North Atlantic Ocean. Proceedings of the U.S. National Museum, vol. 106, no. 3370, p. 331-337.

60. Lindner, Milton J., and William W. Anderson.
1956. Growth, migrations, spawning and size distribution of shrimp, *Penaeus setiferus*. U.S. Fish and Wildlife Service, Fishery Bulletin 106, vol. 56, p. 555-645.

61. Wilson, William B., and Sammy M. Ray.
1956. The occurrence of *Gymnodinium brevis* in the western Gulf of Mexico. Ecology, vol. 37, no. 2, p. 388.

62. Chin, Edward, and Donald M. Allen.
1957. Toxicity of an insecticide to two species of shrimp, *Penaeus aztecus* and *Penaeus setiferus*. Texas Journal of Science, vol. 9, no. 3, p. 270-278.

63. Collier, Albert W.
1957. Gulf-II semiautomatic plankton sampler for inboard use. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 199, 11 p.

64. Costello, Thomas J.
1957. Aims and progress in Gulf Fishery Investigations' shrimp research. Proceedings of the Gulf and Caribbean Fisheries Institute, 9th Annual Session, 1956, p. 5-6.

65. Ray, Sammy M., and William B. Wilson.
1957. The effects of unialgal and bacteria-free cultures of *Gymnodinium brevis* on fish and notes on related studies with bacteria. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 311, 50 p.

66. Dawson, Charles E., Jr.
*1957. Studies on the marking of commercial shrimp with biological stains. U.S. Fish and Wildlife Service Special Scientific Report--Fisheries No. 231, 24 p.

67. Fleminger, Abraham.
1957. New calanoid copepods of *Pontella* Dana and *Labidocera* Lubbock with notes on the distribution of the genera in the Gulf of Mexico. Tulane Studies in Zoology, vol. 5, no. 2, p. 19-34.

68. Fleminger, Abraham.
1957. New genus and two new species of Tharybidae (Copepoda Calanoida) from the Gulf of Mexico with remarks on the status of the family. U.S. Fish and Wildlife Service, Fishery Bulletin 116, vol. 57, p. 347-354.

69. Fleminger, Abraham.
1957. New calanoid copepods of the families Aetideidae, Euchaetidae, and Stephidae from the Gulf of Mexico. U.S. Fish and Wildlife Service, Fishery Bulletin 117, vol. 57, p. 355-363.

70. Ray, Sammy M., and William B. Wilson.
1957. Effects of unialgal and bacteria-free cultures of *Gymnodinium brevis* on fish and notes on related studies with bacteria. U.S. Fish and Wildlife Service, Fishery Bulletin 123, vol. 57, p. 469-496.

71. Starr, Theodore J., and Walter Fosberg.
1957. Filter paper electrophoresis of serum proteins from sharks. Copeia, 1957, no. 4 (December), p. 292-295.

72. Starr, Theodore J., and Mary Elizabeth Jones.
1957. The effect of copper on the growth of bacteria isolated from marine environments. Limnology and Oceanography, vol. 2, no. 1, p. 33-36.

73. Starr, Theodore J., Domingo Martinez, and Walter Fosberg.
1957. The vitamin-B_{12} activity of mullet and shark serum. Limnology and Oceanography, vol. 2, no. 2, p. 111-113.

74. Starr, Theodore J., Mary E. Jones, and Domingo Martinez.
1957. The production of vitamin B_{12}-active substances by marine bacteria. Limnology and Oceanography, vol. 2, no. 2, p. 114-119.

75. Marvin, Kenneth T.
1957. A device for rapid conversion of titration values to salinity. Limnology and Oceanography, vol. 2, no. 4, p. 371-374.

76. Collier, Albert W.
1958. Some biochemical aspects of red tides and related oceanographic problems. Limnology and Oceanography, vol. 3, no. 1, p. 33-39.

77. Allen, Donald M., and Anthony Inglis.
1958. A pushnet for quantitative sampling of shrimp in shallow estuaries. Limnology and Oceanography, vol. 3, no. 2, p. 239-241.

78. Collier, Albert W.
1958. Gulf of Mexico physical and chemical data from ALASKA cruises. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 249, 417 p.

79. Anderson, William W., and Milton J. Lindner.
1958. Length-weight relation in the common or white shrimp, *Penaeus setiferus*. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 256, 13 p.

80. Arnold, Edgar L., Jr., and John R. Thompson.
1958. Offshore spawning of the striped mullet, *Mugil cephalus*, in the Gulf of Mexico. Copeia, 1958, no. 2 (June), p. 130-132.

81. Arnold, Edgar L., Jr.
1958. Gulf of Mexico plankton investigations, 1951-53. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 269, 53 p.

82. Chin, Edward.
1958. Shrimping in Galveston Bay. The Conservationist (Baytown, Texas), vol. 2, no. 8, p. 2.

83. Marvin, Kenneth T., and Larence M. Lansford.
1958. Production of large amounts of pure water. Analytical Chemistry, vol. 30, no. 4, p. 551-552.

84. Rounsefell, George A.
1958. Anadromy in North American Salmonidae. U.S. Fish and Wildlife Service, Fishery Bulletin 131, vol. 58, p. 171-185.

85. Rounsefell, George A.
1958. Shrimp research by the U.S. Fish and Wildlife Service. Proceedings of the Gulf and Caribbean Fisheries Institute, 10th Annual Session, 1957, p. 43-44.

86. Rounsefell, George A., and John E. Evans.
1958. Large-scale experimental test of copper sulfate as a control for the Florida red tide. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 270, 57 p.

87. Starr, Theodore J.
1958. Notes on a toxin from *Gymnodinium breve*. Texas Reports on Biology and Medicine, vol. 16, no. 4, p. 500-507.

88. U.S. Fish and Wildlife Service.
1958. Annual report of the Gulf Fishery Investigations for the year ending June 30, 1958. Galveston, Texas, 106 p.

89. Zein-Eldin, Zoula P., and Billie Z. May.
1958. New absorption peak of tyrosine. Science, vol. 127, no. 3305, p. 1055-1056.

90. Zein-Eldin, Zoula P., and Billie Z. May.
1958. Improved N-ethylcarbazole determination of carbohydrates with emphasis on sea water samples. Analytical Chemistry, vol. 30, no. 12, p. 1935-1941.

91. A. and M. College of Texas, Department of Oceanography and Meteorology.
*1959. Planning of hydrological studies for the Corps of Engineers' proposed Mississippi River-Gulf Outlet Project, Louisiana, A. and M. Project 185, Reference 59-5T, 33 p., 8 figs. (Processed.)

92. A. and M. College of Texas, Department of Oceanography and Meteorology.
*1959. Hydrological studies for the Corps of Engineers' proposed Mississippi River-Gulf Outlet Project, Louisiana. (Report 1.) A. and M. Project 210, Reference 59-21T, 24 p., 107 figs. (Processed.)

93. Chin, Edward.
1959. An inexpensive re-circulating sea-water system. Progressive Fish-Culturist, vol. 21, no. 2 (April), p. 91-93.

94. Chin, Edward, and Donald M. Allen.
1959. A list of references on the biology of shrimp (family Penaeidae). U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 276, 143 p.

95. Costello, Thomas J.
1959. Marking shrimp with biological stains. Proceedings of the Gulf and Caribbean Fisheries Institute, 11th Annual Session, 1958, p. 1-6.

96. Finucane, John H., and Alexander Dragovich.
1959. Counts of red tide organisms, *Gymnodinium breve*, and associated oceanographic data from Florida west coast, 1954-57. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 289, 220 p.

97. Fleminger, Abraham.
1959. Distribution of calanoid copepods in the Gulf of Mexico. International Oceanographic Congress, 1959. Preprints of abstracts of papers. American Association for the Advancement of Science, Washington, p. 153-154.

98. Inglis, Anthony, and Edward Chin.
1959. The bait shrimp industry of the Gulf of Mexico. U.S. Fish and Wildlife Service, Fishery Leaflet 480, 14 p. (Revision of Fishery Leaflet 337.)

99. Rounsefell, George A.
1959. On the dynamics of exploited fish populations, by R. J. H. Beverton and S. J. Holt. [A review.] Limnology and Oceanography, vol. 4, no. 2, p. 230-231.

100. Rounsefell, George A., and Charles H. Lyles.
1959. Sea food for sale. Texas Game and Fish, vol. 17, no. 5, p. 34-35.

101. Starr, Theodore J., and Fred Sanders.
1959. Some ecological aspects of vitamin B_{12}-active substances. Texas Reports on Biology and Medicine, vol. 17, no. 1, p. 49-59.

102. Starr, Theodore J.
1959. A bacteriological technique for the isolation of marine diatoms. Texas Reports on Biology and Medicine, vol. 17, no. 4, p. 624-625.

103. U.S. Fish and Wildlife Service.
1959. Galveston Biological Laboratory Fishery Research for the year ending June 30, 1959. U.S. Fish and Wildlife Service, Circular 62, 127 p.

104. Young, Joseph H.
*1959. Morphology of the white shrimp, *Penaeus setiferus* (Linnaeus 1758). U.S. Fish and Wildlife Service, Fishery Bulletin 145, vol. 59, 168 p.

105. Skud, Bernard E., and George A. Rounsefell.
1960. Fish and ships, by Ralph W. Andrews and A. K. Larssen. [A review.] Transactions of the American Fisheries Society, vol. 89, no. 1, p. 84-85.

106. Chin, Edward.
1960. The bait shrimp fishery of Galveston Bay, Texas. Transactions of the American Fisheries Society, vol. 89, no. 2, p. 135-141.

107. Rounsefell, George A.
1960. Rainbow trout in Mexico and California, with notes on the cutthroat series, by Paul R. Needham and Richard Gard. [A review.] Transactions of the American Fisheries Society, vol. 89, no. 2, p. 243-244.

108. Kutkuhn, Joseph H.
1960. Handbook of computations for biological statistics of fish populations, by William E. Ricker. [A review.] Transactions of the American Fisheries Society, vol. 89, no. 2, p. 244-245.

109. Aldrich, David V.
1960. The physiology of fishes, edited by Margaret E. Brown. [A review.] Transactions of the American Fisheries Society, vol. 89, no. 3, p. 316.

110. Aldrich, David V., and William B. Wilson.
1960. The effect of salinity on growth of *Gymnodinium breve* Davis. Biological Bulletin, vol. 119, no. 1, p. 57-64.

111. Christmas, James Y., Gordon Gunter, and Edward C. Whatley.
*1960. Fishes taken in the menhaden fishery of Alabama, Mississippi, and eastern Louisiana. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 339, 10 p.

112. Arnold, Edgar L., Jr., Ray S. Wheeler, and Kenneth N. Baxter.
1960. Observations on fishes and other biota of East Lagoon, Galveston Island. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 344, 30 p.

113. Caldwell, David K., J. B. Siebenaler, and Anthony Inglis.
1960. Sperm and pigmy sperm whales stranded in the Gulf of Mexico. Journal of Mammalogy, vol. 41, no. 1, p. 136-138.

114. Naab, Ronald C.
1960. Principles of fisheries development, by C. J. Bottemanne. [A review.] Transactions of the American Fisheries Society, vol. 89, no. 3, p. 317.

115. Christmas, James Y., and Gordon Gunter.
*1960. Distribution of menhaden, genus *Brevoortia*, in the Gulf of Mexico. Transactions of the American Fisheries Society, vol. 89, no. 4, p. 338-343.

116. Zein-Eldin, Zoula P.
1960. Endocrine control in crustaceans, by David B. Carlisle and Sir Francis G. W. Knowles. [A review.] Transactions of the American Fisheries Society, vol. 89, no. 4, p. 385.

117. Costello, Thomas J., and Donald M. Allen.
1960. Notes on the migration and growth of pink shrimp *(Penaeus duorarum)*. Proceedings of the Gulf and Caribbean Fisheries Institute, 12th Annual Session, 1959, p. 5-9.

118. Gates, Jean A., and William B. Wilson.
1960. The toxicity of *Gonyaulax monilata* Howell to *Mugil cephalus*. Limnology and Oceanography, vol. 5, no. 2, p. 171-174.

119. Marvin, Kenneth T., Zoula P. Zein-Eldin, Billie Z. May, and Larence M. Lansford.
1960. Chemical analyses of marine and estuarine waters used by the Galveston Biological Laboratory. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 349, 14 p.

120. Iverson, Edwin S., Andrew E. Jones, and Clarence P. Idyll.
*1960. Size distribution of pink shrimp *Penaeus duorarum*, and fleet concentrations on the Tortugas fishing grounds. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 356, 62 p.

121. Gunter, Gordon, and James Y. Christmas.
*1960. A review of literature on menhaden with special reference to the Gulf of Mexico menhaden, *Brevoortia patronus* Goode. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 363, 31 p.

122. Koczy, F. F., M. O. Rinkel, and S. J. Niskin.
*1960. The current patterns on the Tortugas shrimp grounds. Proceedings of the Gulf and Caribbean Fisheries Institute, 12th Annual Session, 1959, p. 112-125.

123. May, Billie Z.
1960. Stabilization of the carbohydrate content of sea water samples. Limnology and Oceanography, vol. 5, no. 3, p. 342-343.

124. Reintjes, John W., James Y. Christmas, Jr., and Richard A. Collins.
*1960. Annotated bibliography on biology of American menhaden. U.S. Fish and Wildlife Service, Fishery Bulletin 170, vol. 60, p. 297-322.

125. Renfro, William C.
1960. Salinity relations of some fishes in the Aransas River, Texas. Tulane Studies in Zoology, vol. 8, no. 3, p. 83-91.

126. Skud, Bernard E., and William B. Wilson.
1960. Role of estuarine waters in Gulf fisheries. Transactions of the 25th North American Wildlife and Natural Resources Conference, p. 320-326.

127. Thompson, John R., and Winthrop A. Haskell.
1960. From trash to treasure. Petfood Industry, vol. 2, no. 12, p. 10-13.

128. U.S. Fish and Wildlife Service.
1960. Galveston Biological Laboratory Fishery Research for the year ending June 30, 1960. U.S. Fish and Wildlife Service, Circular 92, 77 p.

129. Zein-Eldin, Zoula P.
1961. Plankton pigments in East Lagoon, Galveston, Texas. Transactions of the American Fisheries Society, vol. 90, no. 1, p. 32-41.

130. Breedlove, Stella.
1961. Current bibliography for aquatic sciences and fisheries, compiled by Food and Agriculture Organization, Fisheries Biology Branch. [A review.] Transactions of the American Fisheries Society, vol. 90, no. 1, p. 86.

131. Finucane, John H., and Billie Z. May.
1961. Modified Van Dorn sampler. Limnology and Oceanography, vol. 6, no. 1, p. 85-87.

132. Haskell, Winthrop A.
1961. Gulf of Mexico trawl fishery for industrial species. U.S. Fish and Wildlife Service, Commercial Fisheries Review, vol. 23, no. 2 (February), p. 1-6.

133. Rounsefell, George A.
1961. How can research production be measured? Proceedings of the Gulf and Caribbean Fisheries Institute, 13th Annual Session, 1960, p. 139-150.

134. Skud, Bernard Einar.
1961. Education and recruitment of oceanographers in the United States. A report by the Committee on Education and Recruitment, American Society of Limnology and Oceanography, Inc., August 30, 1960. [A review.] Transactions of the American Fisheries Society, vol. 90, no. 2, p. 232.

135. Inglis, Anthony.
1961. Ecology of inland waters and estuaries, by George K. Reid, [A review.] Transactions of the American Fisheries Society, vol. 90, no. 2, p. 232-233.

136. U.S. Fish and Wildlife Service.
1961. The Florida red tide, by Staff of the Bureau of Commercial Fisheries Biological Laboratory, Galveston, Texas. U.S. Fish and Wildlife Service, Fishery Leaflet 506, 8 p.

137. Dragovich, Alexander.
1961. Relative abundance of plankton off Naples, Florida, and associated hydrographic data, 1956-57. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 372, 41 p.

138. Marvin, Kenneth T., Larence M. Lansford, and Ray S. Wheeler.
1961. Effects of copper ore on the ecology of a lagoon. U.S. Fish and Wildlife Service, Fishery Bulletin 184, vol. 61, p. 153-160.

139. Dobkin, Sheldon.
*1961. Early developmental stages of the pink shrimp, *Penaeus duorarum*, from Florida waters. U.S. Fish and Wildlife Service, Fishery Bulletin 190, vol. 61, p. 321-349.

140. Dragovich, Alexander, John H. Finucane, and Billie Z. May.
1961. Counts of red tide organisms *Gymnodinium breve* and associated oceanographic data from Florida west coast, 1957-59. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 369, 175 p.

141. Rounsefell, George A.
1961. Fishery management, by R.S. Fort and J. D. Brayshaw. [A review.] Transactions of the American Fisheries Society, vol. 90, no. 3, p. 341-342.

142. Rounsefell, George A.
1961. Living fishes of the world, by Earl S. Herald. [A review.] Transactions of the American Fisheries Society, vol. 90, no. 3, p. 341.

143. Costello, T. J.
1961. Use of stains in shrimp mark-recapture experiments. ICNAF North Atlantic Fish Marking Symposium, May 1961, Contribution No. 23, 5 p.

144. U.S. Fish and Wildlife Service.
1961. Galveston Biological Laboratory Fishery Research for the year ending June 30, 1961. U.S. Fish and Wildlife Service, Circular 129, 82 p.

145. Kimsey, J. Bruce.
1962. Rate of metabolism and food requirements of fishes, by G. G. Winberg. [A review.] Transactions of the American Fisheries Society, vol. 91, no. 1, p. 129-130.

146. Temple, Robert F.
1962. Measuring the production of marine phytoplankton, by J. D. H. Strickland. [A review.] Transactions of the American Fisheries Society, vol. 9, no. 1, p. 129.

147. Allen, Donald M., and T. J. Costello.
1962. Grading large numbers of live shrimp for marking experiments. U.S. Fish and Wildlife Service, Progressive Fish-Culturist, vol. 24, no. 1 (January), p. 46-48.

148. Costello, T. J., and D. M. Allen.
1962. Survival of tagged, stained, and unmarked shrimp in the presence of predators. Proceedings of the Gulf and Caribbean Fisheries Institute, 14th Annual Session, 1961, p. 16-20.

149. Kutkuhn, Joseph H.
1962. Recent trends in white shrimp stocks of the northern Gulf. Proceedings of the Gulf and Caribbean Fisheries Institute, 14th Annual Session, 1961, p. 3-16.

150. Kutkuhn, Joseph H.
1962. Conversion of "whole" and "headless" weights in commercial Gulf of Mexico shrimps. U.S. Fish and Wildlife Service, Special Scientific Report--Fisheries No. 409, 7 p.

151. VanDerwalker, John G., and Edward Chin.
1962. A device for feeding brine shrimp to fishes. Transactions of the American Fisheries Society, vol. 91, no. 2, p. 230-231.

152. Rounsefell, George A.
1962. Relationships among North American Salmonidae. U.S. Fish and Wildlife Service, Fishery Bulletin 209, vol. 62, p. 235-270.

153. Kutkuhn, Joseph H.
1962. Gulf of Mexico commercial shrimp populations - trends and characteristics 1956-1959. U.S. Fish and Wildlife Service, Fishery Bulletin 212, vol. 62, p. 343-402., 25 figs.).

154. Dragovich, Alexander, and Billie Z. May.
1962. Hydrological characteristics of Tampa Bay Tributaries. U.S. Fish and Wildlife Service, Fishery Bulletin 205, vol. 62, p. 163-176.

155. Renfro, William C., and Harry L. Cook.
In press. Early larval stages of the seabob, *Xiphopeneus krøyeri* (Heller). U.S. Fish and Wildlife Service, Fishery Bulletin____, vol. 63 (37 MS. p., 20 figs.).

156. Kutkuhn, Joseph H.
1962. Research at the Galveston Biological Laboratory. In Proceedings of the First National Coastal and Shallow Water Research Conference, October 1961. National Science Foundation and the Office of Naval Research, Tallahassee, Florida, p. 251-256.

157. Aldrich, David V.
In press. Photoautotrophy in *Gymnodinium breve* Davis. Science, vol.____, no.____, p._____ (10 MS. p.).

158. Marvin, Kenneth T., and Larence M. Lansford.
In press. Phosphorus content of some fishes and shrimp in the Gulf of Mexico. Publications of the Institute of Marine Science, vol.____, no.___, p._____(10 MS. p.).

159. Rounsefell, George A.
1962. Introduction to the study of animal populations, by H. G. Andrewartha. [A review.] Transactions of the American Fisheries Society, vol. 91, no. 3, p. 330.

160. Rounsefell, George A.
1963. Marking fish and invertebrates. U.S. Fish and Wildlife Service, Fishery Leaflet 549, 12 p.

161. Proctor, Raphael R., Jr.
In press. Stabilization of the nitrate content of sea water by freezing. Limnology and Oceanography, vol. ___, no.____, p.____(5 MS. p., 1 fig.).

163. Rounsefell, George A.
1963. The Bureau of Commercial Fisheries Biological Laboratory, Galveston, Texas. U.S. Fish and Wildlife Service, Circular 154, 29 p.

164. Kutkuhn, Joseph H.
1963. Dynamics of a penaeid shrimp population and management implications. U.S. Fish and Wildlife Service, Fishery Bulletin ___, vol.____, p.____(82 MS. p., 13 figs.).

165. Marvin, Kenneth T., C. M. Proctor, and J. E. Stein.
In press. Factors affecting the reliability of chlorinity analyses. Limnology and Oceanography, vol. ___, no.____, p.____(16 MS. p.).

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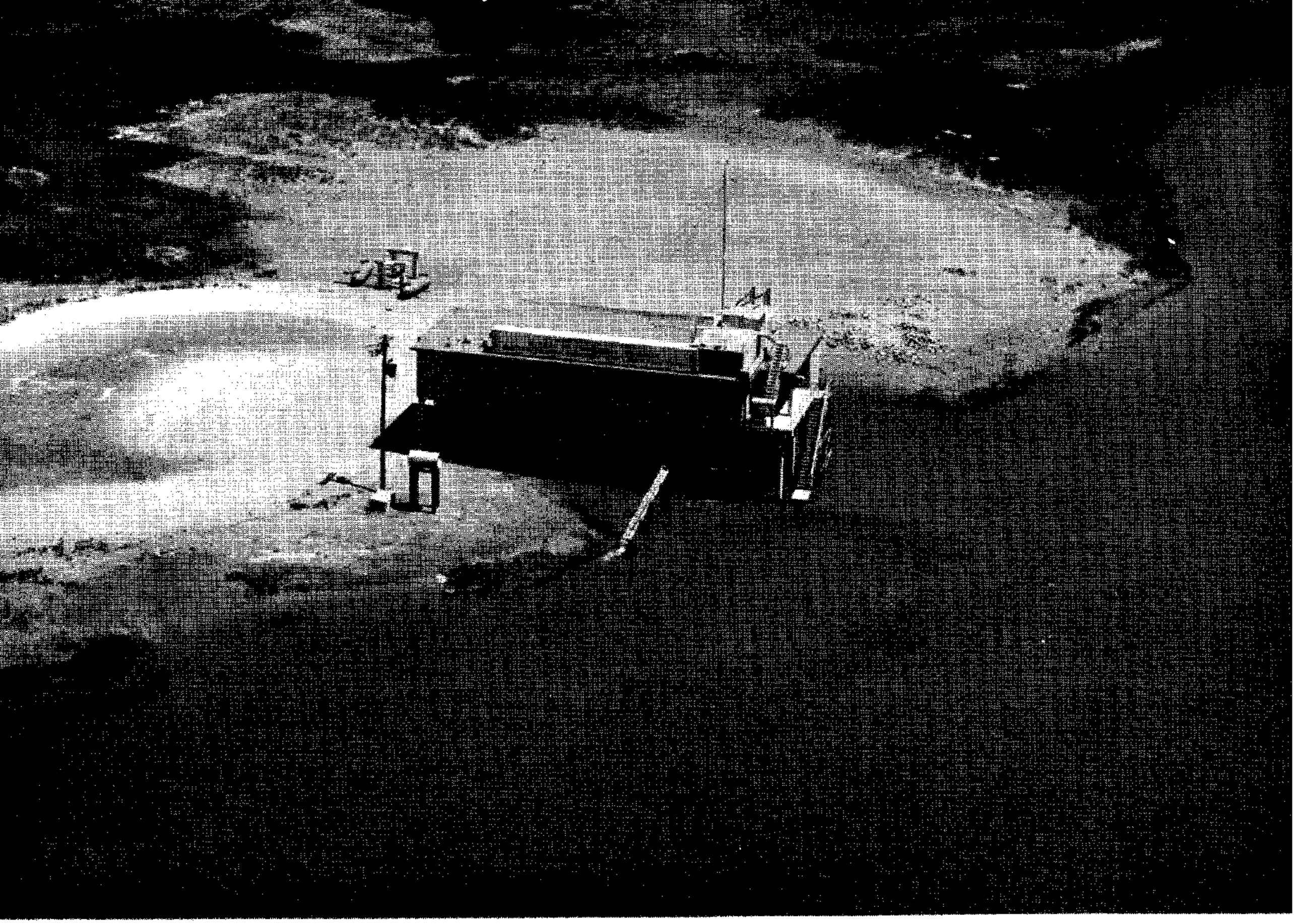
GPO 935933



The East Lagoon Field Station, completed and operative in 1962, only 4 miles from the main laboratory, affords an opportunity to work on living material in almost natural conditions. *(Photographed by Lew Stewart.)*

Created in 1849, the Department of the Interior--America's Department of Natural Resources--is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

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